PHOTOFACT* Folder
with CIRCUITRACE*

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove 4 push-on type knobs from the front.
2. Remove 8 wood screws holding the rear cover. Remove the rear cover.
3. Remove 5 wood screws holding the trim strip at the top edge of the safety glass. Tilt glass out at the top and remove.
4. Remove 2 phillips screws holding mask and remove mask.
5. Remove 2 screws from the front holding tuner bracket.
6. Loosen 2 wood screws holding the antenna terminal board.
7. Remove the picture socket, HV lead, speaker leads and FM-AM Tuner leads.
8. Remove 2 screws holding the side control panel and tuner.
9. Remove 2 screws (from inside cabinet) holding the On-Off-Volume and Contrast Control bracket.
10. Loosen yoke clamp.
11. Remove 2 wood screws holding the top chassis braces.
12. Remove 4 chassis bolts from the bottom.
13. Remove the chassis and yoke.

MODEL 1440 (CH. 120417S)

TRADE NAME	Emerson	MODELS	CHASSIS
		1414	120407S
		1415	120408U
		1438, 1440	120417S
		1439, 1441	120418U
		1434	120420S
		1435	120421U
		1432	120422S
		1433	120423U
		1438, 1439	AM Radio.. 120397B
		1440, 1441	FM-AM Radio.. 120419B

MANUFACTURER	Emerson Radio & Phonograph Corp., 14th. & Coles Sts., Jersey City 2, N.J.
TYPE SET	Combination Television & FM-AM Receiver With Phono
TUBES	TV - 18, FM-AM - 7
POWER SUPPLY	110-120 Volts AC, 60 Cycle RATING TV 190 Watts, 1.77 Amp. @ 117 Volts AC FM-AM 30 Watts, .34 Amp. @ 117 Volts AC (Less Motor)
TUNING RANGE	TV Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier) FM 88-108MC IF 10.7MC AM 540-1638KC IF 455KC

NOTE: MODELS 1438, 1439, 1440, 1441 USE RECORD CHANGER #819113. FOR SERVICE INFORMATION SEE SIMILAR UNIT IN PHOTOFACT SET 353 FOLDER 16.

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustment of the VHF Oscillator is possible by removing the rear cover, and supplying power to the receiver. Set the Fine Tuning at the center of its range. The adjustments are accessible, one at a time, thru a hole in the right side of the tuner rear cover as viewed from the rear. Adjust for best picture and sound.

PICTURE TUBE SAFETY GLASS CLEANING

Remove 4 push-on type knobs from the front. Remove 5 wood screws holding the trim strip at the top edge of the safety glass. Tilt glass out at the top and lift up to remove.

SPECIAL ADJUSTMENTS

A. Local-Distance
Observe the picture and advance the Local-Distance Control to a point where the picture distorts or a buzz is heard in the sound. Back off from this setting until the picture becomes stable with no noise in the sound.

B. Focus
No provision is made to vary the focus on this receiver.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENTS

For adjustment of the Horizontal Oscillator, it is necessary to remove the rear cover and supply power to set. Set the Horizontal Hold at the center of its range and adjust the Horizontal Frequency slug (B1) until the picture synchronizes horizontally. (For location, see tube placement chart.)

FUSE

One fuse is used for LV power supply protection and a fuse wire is used for filament protection.

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube. Rotate the two rings around the neck of the tube until the picture is properly centered.

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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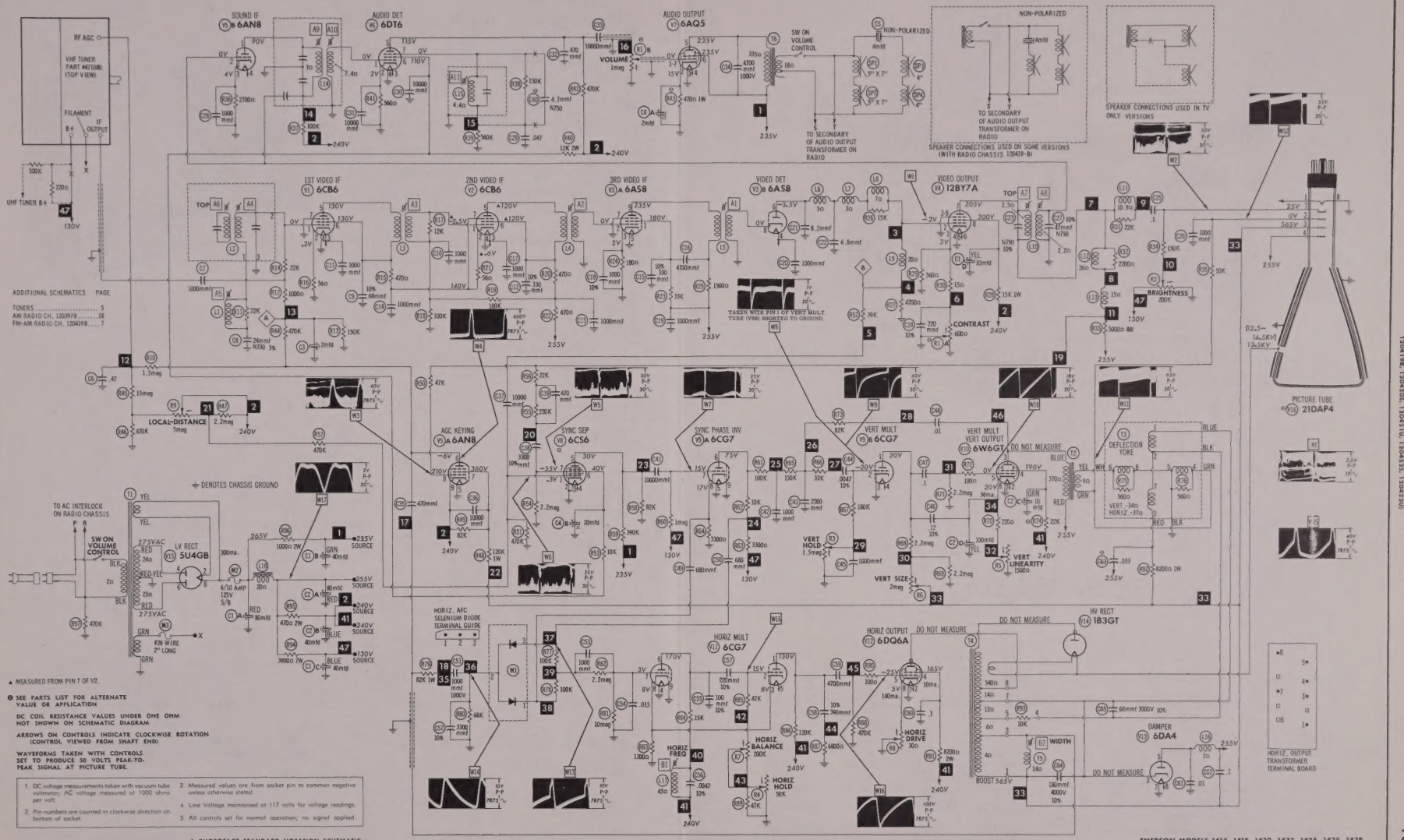
H707

EMERSON MODELS 1414, 1415, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 120397B, 120407S, 120408U, 120417S, 120418U, 120419B, 120420S, 120421U, 120422S, 120423U)
SET 416 FOLDER 1


SOUND IF V5 6AN8
AUDIO DET V6 6DT6
AUDIO OUTPUT V7 6AQ5
1ST VIDEO IF V1 6CB6
2ND VIDEO IF V2 6CB6
3RD VIDEO IF V3 6AS8
VIDEO DET V7 6AS8
VIDEO OUTPUT V4 12BY7A
AGC KEYING V5 6AN8
SYNC SEP V6 6CS6
SYNC PHASE INV V9 6CG7
VERT MULT V9 6CG7
VERT MULT VERT OUTPUT V10 6W6GT
HORIZ. AFC SELENIUM DIODE TERMINAL GUIDE
HORIZ MULT V11 6CG7
HORIZ OUTPUT V12 6DQ6A
HV RECT V14 1B3GT
DAMPER V13 6DA4
LV RECT V13 5U4GB
PICTURE TUBE V16 21DAP4
VOLUME
CONTRAST
BRIGHTNESS
HORIZ FREQ
HORIZ BALANCE
HORIZ HOLD
HORIZ DRIVE
WIDTH
VERT SIZE
VERT LINEARITY
LOCAL-DISTANCE
SW ON VOLUME CONTROL
DENOTES CHASSIS GROUND
TO AC INTERLOCK ON RADIO CHASSIS
TO SECONDARY OF AUDIO OUTPUT TRANSFORMER ON RADIO
SPEAKER CONNECTIONS USED ON SOME VERSIONS (WITH RADIO CHASSIS 120419-B)
SPEAKER CONNECTIONS USED IN TV ONLY VERSIONS
HORIZ. OUTPUT TRANSFORMER TERMINAL BOARD
DO NOT MEASURE
ADDITIONAL SCHEMATICS PAGE
TUNERS 5
AM RADIO CH. 120397B 18
FM-AM RADIO CH. 120419B 7
▲ MEASURED FROM PIN 7 OF V2.
⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM
ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)
WAVEFORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE.
1. DC voltage measurements taken with vacuum tube voltmeter. AC voltage measured at 1000 ohms per volt.
2. Pin numbers are counted in clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated.
4. Line Voltage maintained at 117 volts for voltage readings.
5. All controls set for normal operation; no signal applied.

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE®

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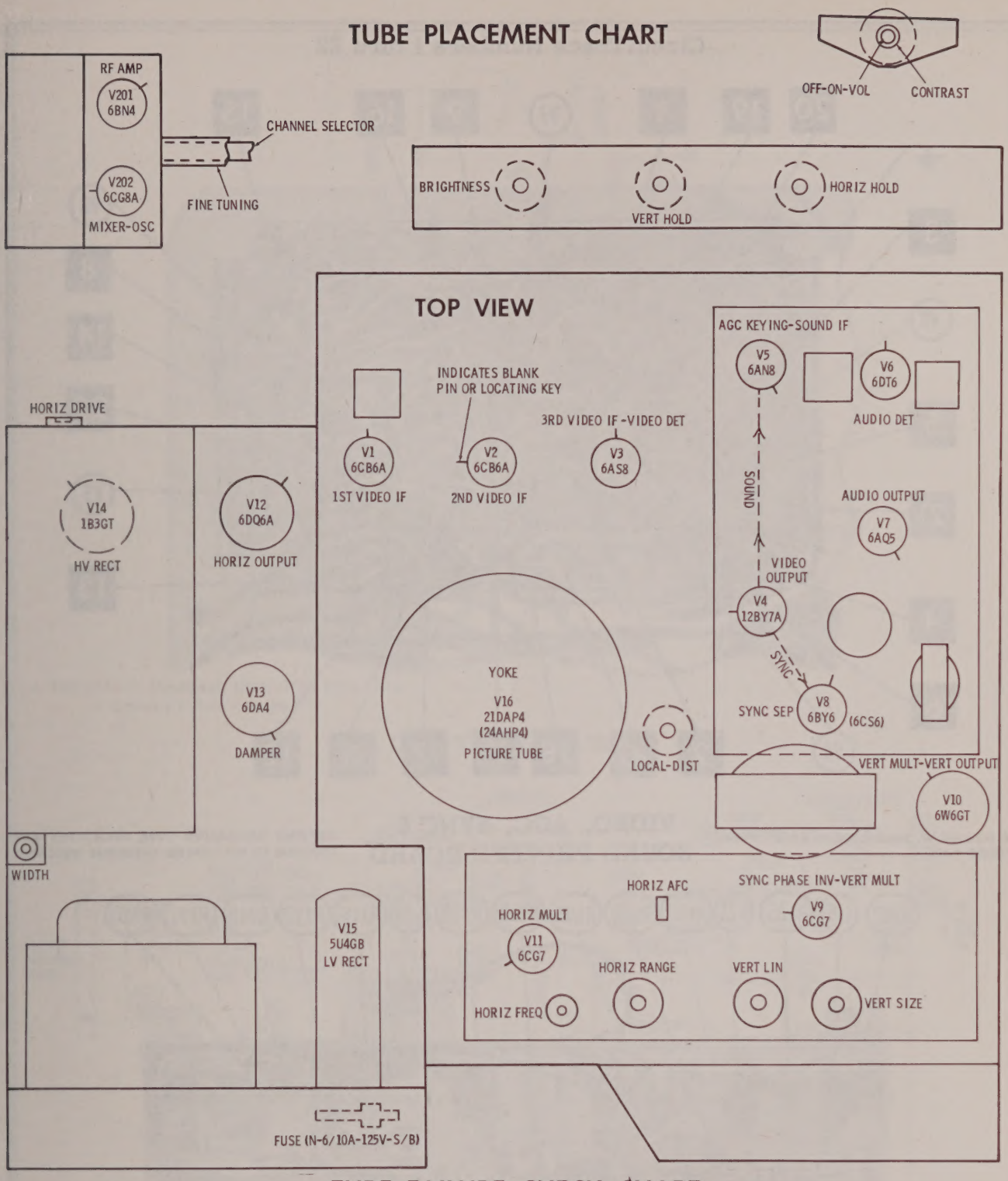
EMERSON MODELS 1414, 1415, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 1203978, 1204075, 1204080, 1204175, 1204180, 1204198, 1204205, 1204210, 1204225, 1204230)

FOLDER 1

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound Fuse (M2, M3), V15

SWEEP FAILURE
No raster, has sound Rectifier (M1), V11, V12, V13, V14, V16
No vertical deflection V9, V10
Poor vert. linearity or foldover V9, V10
Poor horiz. linearity or foldover V11, V12, V13
Narrow picture V11, V12, V13, V15
Vert. off freq. V9, V10
Horiz. off freq. V11

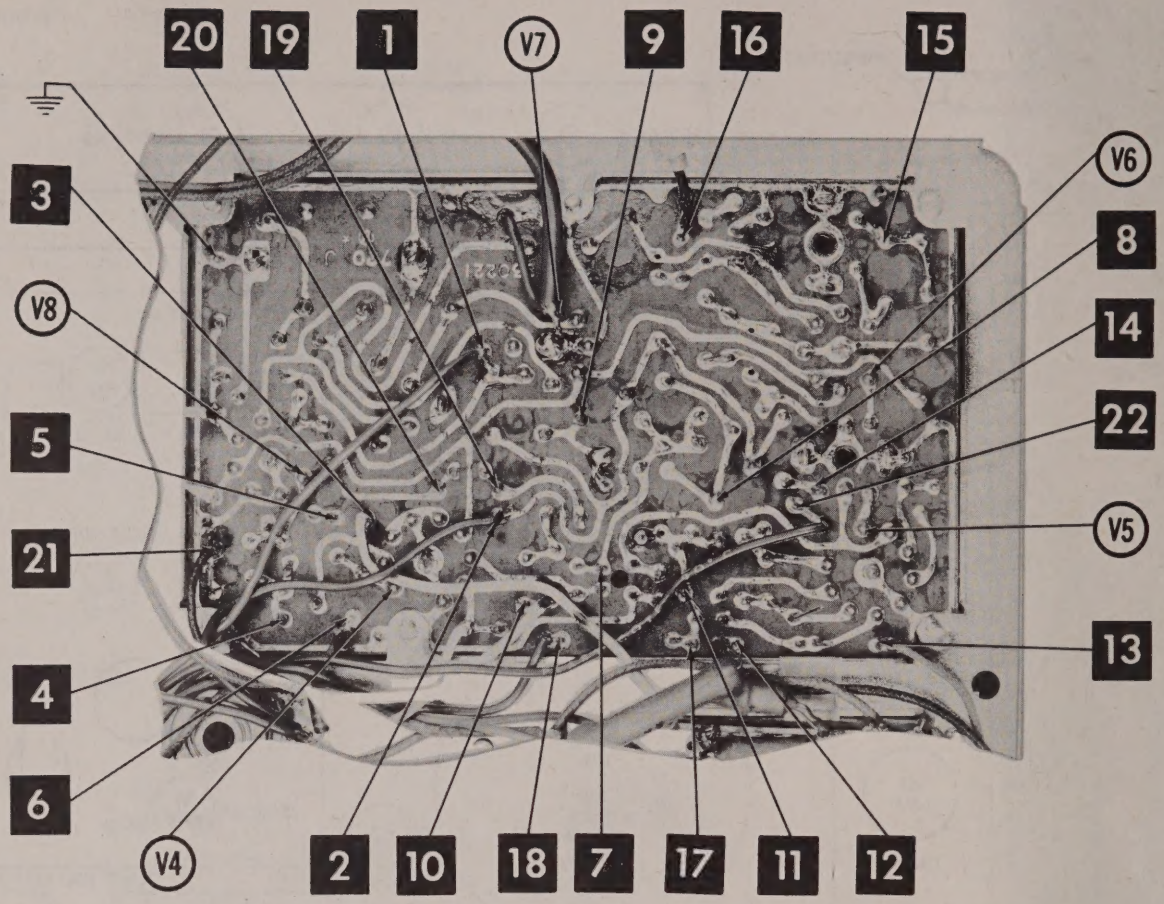
LOSS OF PICTURE OR SOUND
No pic, no sound, has raster V1, V2, V3, V4
No pic, no sound, has snow V201, V202, V1
No pic, has sound, has raster V4, V16
Has pic, no sound V5, V6, V7
Overloaded picture V5

SYNC FAILURE
No vert. sync V8, V9
No horiz. sync V8, V9, M1
No vert. or horiz. sync V8, V9

EMERSON MODELS 1414, 1415, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 120397B, 120407S, 120408U, 120417S, 120418U, 120419B, 120420S, 120421U, 120422S, 120423U)

FOLDER 1

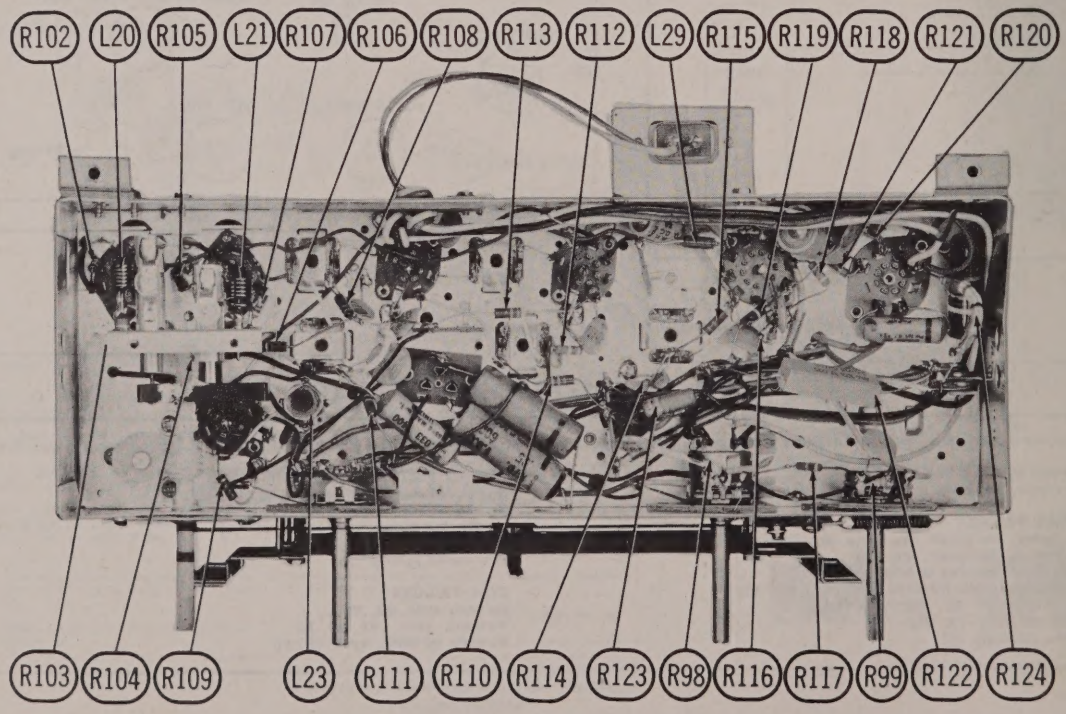
CircuiTrace Numbers 1 thru 22



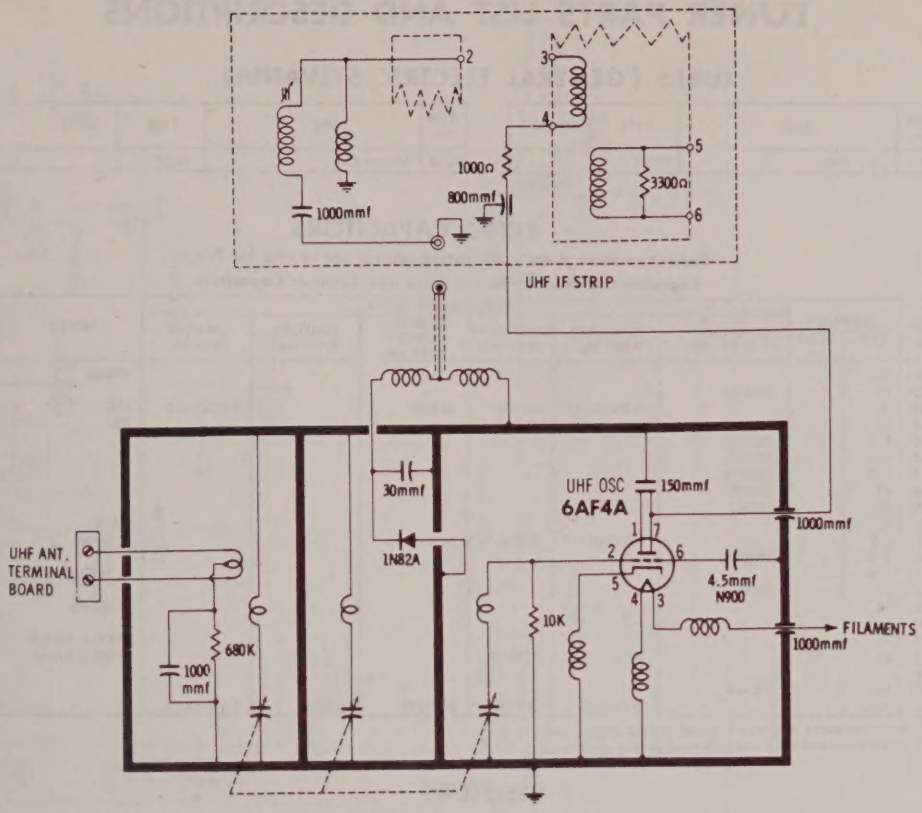
A Howard W. Sams CIRCUITRACE* Photo
*TRADE MARK

VIDEO, AGC, SYNC & SOUND PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



RADIO CHASSIS BOTTOM VIEW - RESISTOR INDUCTOR IDENT



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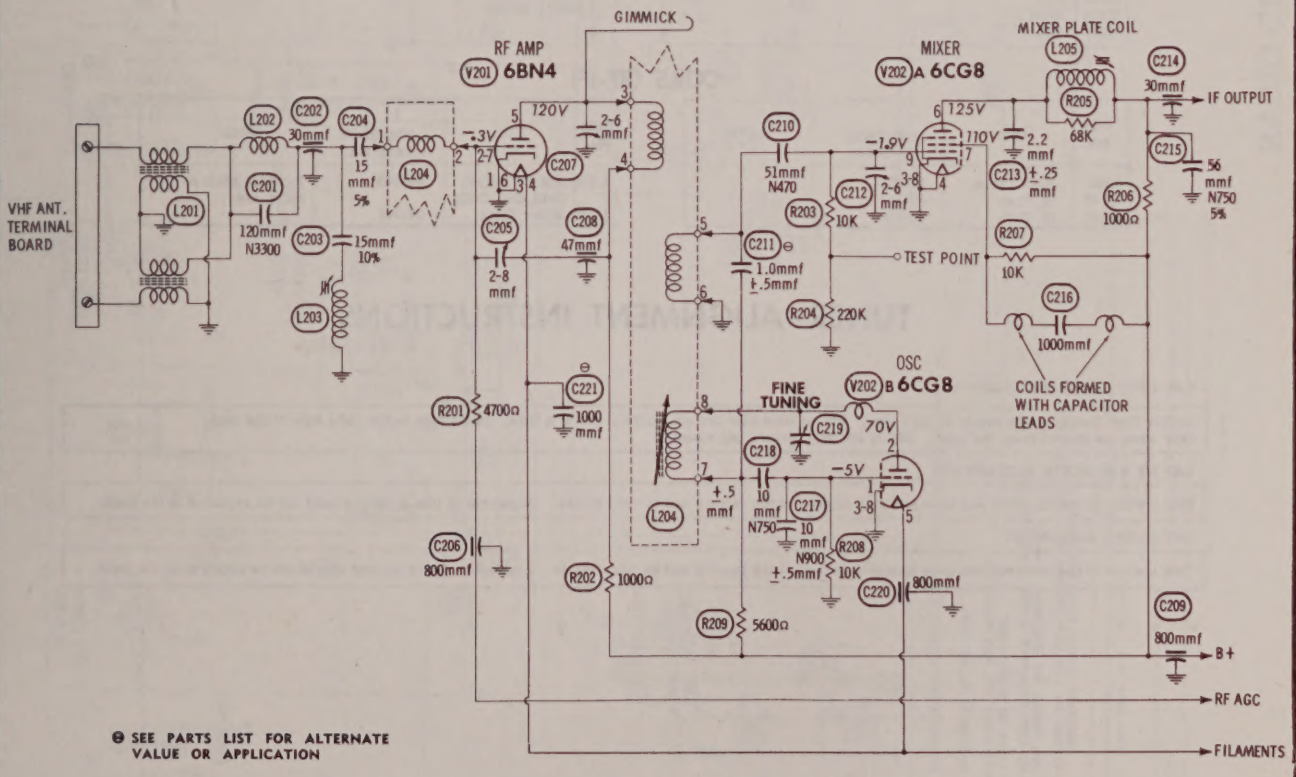
UHF TUNER #471037



Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

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TUNER #471080, 471081, 471096, 471097

TUNER PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amp.	6BN4	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	6CG8	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	EMERSON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	120								N3300
C202	30		961960						
C203	15			NPO-DI 15	DD-150	L10Q15		5TCC-Q15	10%
C204	15				DTZ-15				5%
C205	2-8		962077						
C206	800		961959						
C207	2-6		962078						
C208	47		962094						
C209	800		961959						
C210	51								N470
C211	1.0			NPO-SI 1.0	TCZ-1				±.5mmf ①
C212	2-6		962078						
C213	2.2								±.25mmf
C214	30		961960						
C215	56								N750 5%
C216	1000								
C217	10								N900 ±.5mmf
C218	10			N750-DI 10	DTN-10				N750 ±.5mmf
C219									
C220	800		961959						
C221	1000			BPD-001	DD-102	BYA6D1	DC521	5HK-D1	②

① Some versions may use 1.5mmf in this application.
② Some versions may use 1500mmf in this application.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		EMERSON PART No.	NOTES
	OHMS	WATT		
R201	4700Ω			
R202	1000Ω			
R203	10K			
R204	220K			
R205	68K			

ITEM No.	RATING		EMERSON PART No.	NOTES
	OHMS	WATT		
R206	1000Ω			
R207	10K			
R208	10K			
R209	5600Ω			

COILS (RF-IF)

ITEM No.	USE	EMERSON PART No.	NOTES
L201	Ant. Trans.	961286	
L202	IF Trap	961364	
L203	IF Trap	961661	

ITEM No.	USE	EMERSON PART No.	NOTES
L204	Ant.,RF, Mixer Grid, Osc. Coils	962083	Includes shaft & rotor assy.
L205	Mixer Plate	961943	

TUNER ALIGNMENT INSTRUCTIONS

VHF OSCILLATOR ALIGNMENT

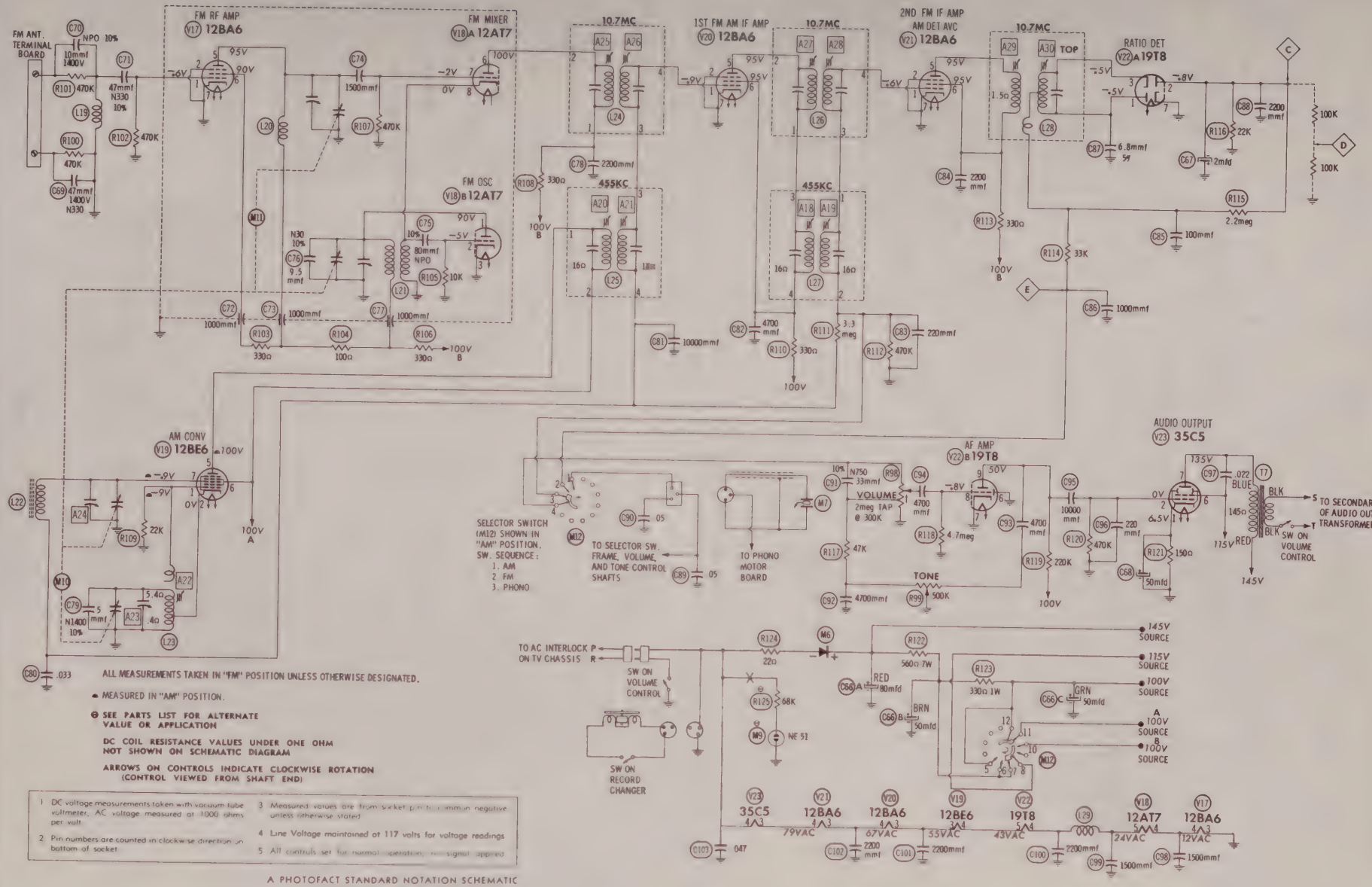
Set the Fine Tuning at the center of its range. The adjustments are accessible, one at a time, thru a hole in the right side of the tuner rear cover as viewed from the rear. Adjust for best picture and sound.

VHF RF AND MIXER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

UHF TUNER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.


FM RF AMP V17 12BA6
FM MIXER V18A 12AT7
FM OSC V18B 12AT7
10.7MC
1ST FM AM IF AMP V20 12BA6
2ND FM IF AMP AM DET AVC V21 12BA6
RATIO DET V22A 19T8
455KC
AM CONV V19 12BE6
AF AMP V22B 19T8
AUDIO OUTPUT V23 35C5
FM ANT. TERMINAL BOARD
SELECTOR SWITCH (M12) SHOWN IN "AM" POSITION. SW. SEQUENCE: 1. AM 2. FM 3. PHONO
TO SELECTOR SW. FRAME, VOLUME, AND TONE CONTROL SHAFTS
TO PHONO MOTOR BOARD
VOLUME 2meg TAP @ 300K
TONE 500K
TO SECONDARY OF AUDIO OUTPUT TRANSFORMER ON TV
SW ON VOLUME CONTROL
TO AC INTERLOCK ON TV CHASSIS
SW ON RECORD CHANGER
145V SOURCE
115V SOURCE
100V SOURCE A
100V SOURCE B
35C5 79VAC 12BA6 67VAC 12BA6 55VAC 12BE6 43VAC 19T8 24VAC 12AT7 12VAC 12BA6
ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.
MEASURED IN "AM" POSITION.
SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION
DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM
ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)
1 DC voltage measurements taken with vacuum tube voltmeter, AC voltage measured at 1000 ohms per volt.
2 Pin numbers are counted in clockwise direction on bottom of socket.
3 Measured values are from socket pin to common negative unless otherwise stated
4 Line Voltage maintained at 117 volts for voltage readings
5 All controls set for normal operation, no signal applied
A PHOTOFACT STANDARD NOTATION SCHEMATIC
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RADIO CHASSIS 120419B

EMERSON MODELS 1414, 1413, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 120397B, 120407S, 120408U, 120417S, 120418U, 120419B, 120420S, 120421U, 120422S, 120423U)

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

The high voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.

VIDEO IF ALIGNMENT

Connect the negative lead of a 3 volt bias supply to point (A) . Positive to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough generator output to provide a usable indication on VTVM.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Direct	Place a thin insulated metal strip between the mixer-osc. tube (V202), and tube shield. Connect the high side of sweep generator to the metal strip. Low side to chassis.	Not used	44.25MC	Any non-interfering channel	USE VTVM. DC probe to point (B) . Low side to chassis. (Across video det. load)	A1	Adjust for maximum deflection.
2.	"	"	"	42.6MC	"	"	A2	"
3.	"	"	"	45.3MC	"	"	A3	"
4.	"	"	"	42.9MC	"	"	A4	"
5.	"	"	"	45.3MC	"	"	Mixer Plate Coil	"
6.	"	"	"	41.25MC	"	"	A5	Increase generator output and adjust for MINIMUM deflection.
7.	"	"	"	47.25MC	"	"	A6	Increase generator output and adjust for MINIMUM deflection. Repeat steps 4 and 5.
8.	"	"	44MC (10MC Swp)	41.25MC 42.9MC 45.75MC 47.25MC	"	Vert. Amp. to point (B) . Low side to chassis. (Across video det. load).		Use only enough sweep generator output to provide a usable pattern on scope. Check for response similar to Fig. 1. If necessary, retouch A1 to place 45.75MC marker in correct position. 42.9MC must not fall below 80%.

4.5MC TRAP ALIGNMENT

Tune in a strong station and adjust the fine tuning to the point where the 4.5MC beat interference just begins to appear in the picture. Adjust A7 for MINIMUM beat pattern in the picture.

SOUND IF ALIGNMENT

Tune in a strong station and adjust A8, A9 and A10 for loudest sound.
Adjust A11 for clearest and loudest sound. If two peaks occur, peak with slug nearest chassis.
Disconnect antenna and loosely couple to obtain weak signal and repeat adjustment of A8, A9 and A10 tuning for maximum sound with MINIMUM distortion.
Check the voltage drop across R39 (560K resistor). It should measure between -4 and -9 volts and should not vary more than two volts between a strong signal and a weak one.
Check sound on all available channels and repeat entire procedure, if necessary.

ALIGNMENT FOR AM RADIO #120397B

Use isolation transformer, if available. If not, connect a .1mfd capacitor in series with low side of signal generator and B-.
Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
9.	.005mfd	High side to antenna stator lug on tuning gang. Low side to chassis.	455KC (400~ Mod)	Radio	Tuning gang fully open.	Across voice coil	A12, A13, A14, A15	Adjust for maximum output.
10.		Loop	1620KC	"	"	"	A16	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
11.		"	1400KC	"	Tune to 1400KC signal.	"	A17	"

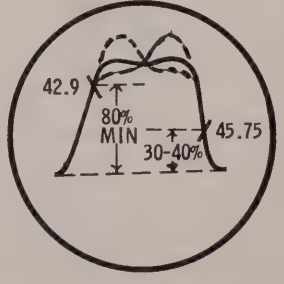
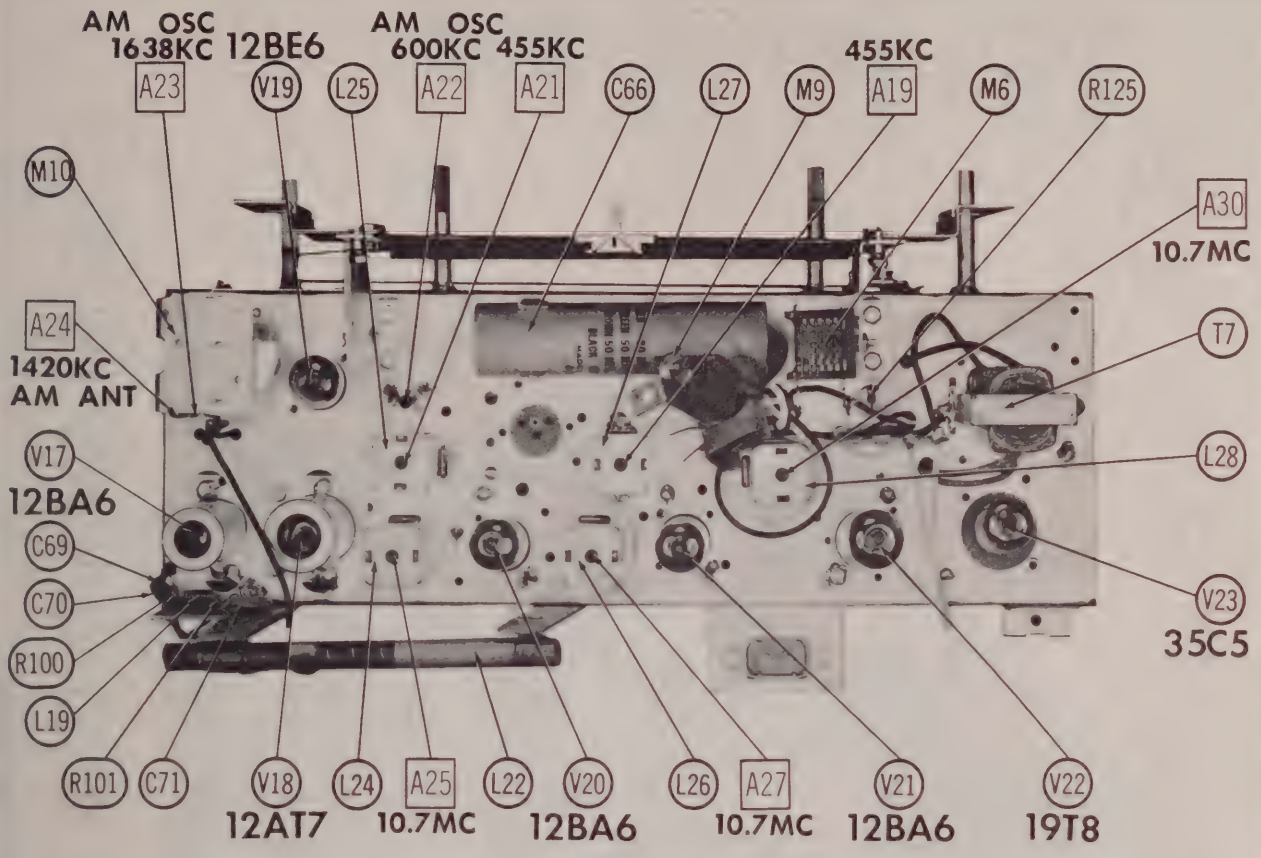
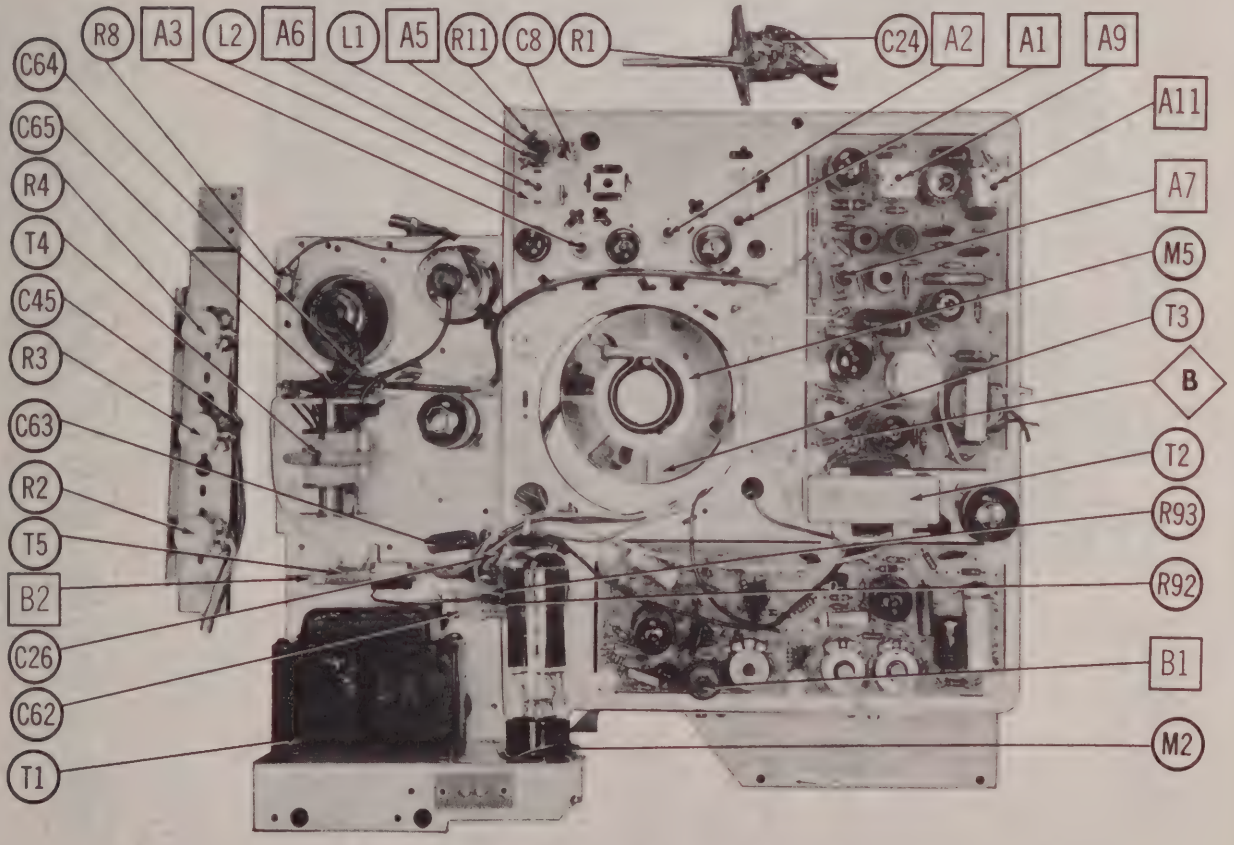


FIG. 1

CONTINUED ON PAGE 17

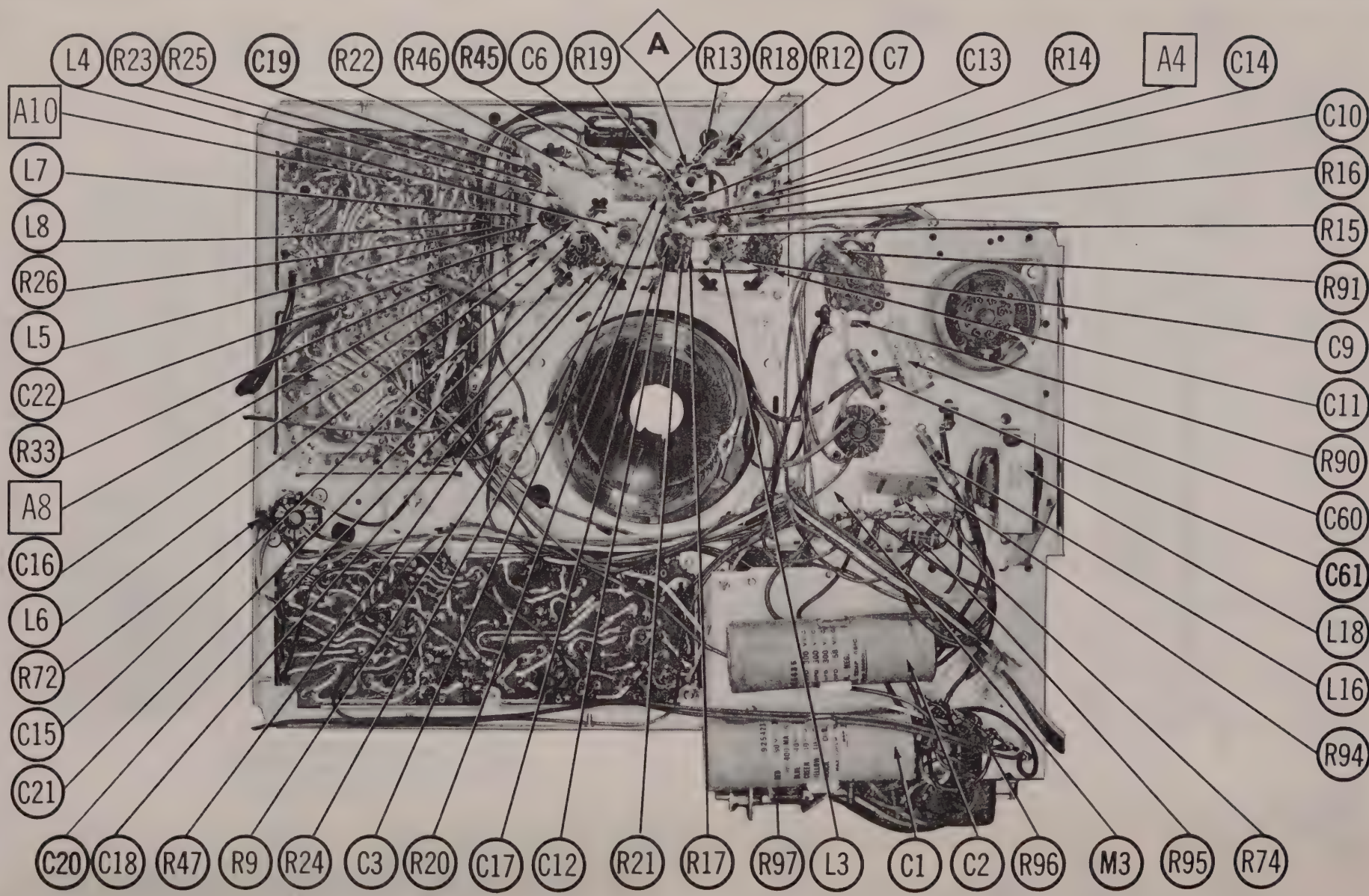


RADIO CHASSIS - TOP VIEW



TV CHASSIS - TOP VIEW

EMERSON MODELS 1414, 1415, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 120397B, 120407S, 120408U, 120417S, 120418U, 120419B, 120420S, 120421U, 120422S, 120423U)



TV CHASSIS - BOTTOM VIEW

TV PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	1st. Video IF Amp.	6CB6	
V2	2nd. Video IF Amp.	6CB6	
V3	3rd. Video IF Amp. - Video Det.	6AS8	
V4	Video Output	12BY7A	
V5	AGC Keying - Sound IF Amp.	6AN8	
V6	Audio Det.	6DT6	
V7	Audio Output	6AQ5	
V8	Sync Sep.	6BY6	* 6CS6
V9	Sync Phase Inv. - Vert. Mult.	6CG7	
V10	Vert. Mult. - Vert. Output	6W6GT	
V11	Horiz. Mult.	6CG7	
V12	Horiz. Output	6DQ6A	
V13	Damper	6DA4	
V14	HV Rect.	1B3GT	
V15	LV Rect.	5U4GB	

* Alternate.

PICTURE TUBE

ITEM No.	REPLACEMENT DATA				NOTES
	EMERSON PART No.	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No.	
V16	21DAP4 24AHP4		21DAP4 ① 24AHP4 ①	21DAP4 ② 24AHP4 ②	① "Silverama" ® ② "Silver Screen 85"

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	EMERSON PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	80	300	925423	PR4-295	BBRQ0926.5			Q-012	R2487 *
B	40	300						MT-4510	
C	40	250							
D	10	300							
C2A	80	300	925436	PR4-700	BBRQ0805	WQ650		T-552	R2207 *
B	40	300						MT-4510	
C	10	300							
D	100	50							
C3	2	25	925293	PRS50V2	BBR2-50	TT150X2	TD-2-25	MT-0502	TVA-1201
C4A	■20	25	925428	AFH2-81-95				FM-0220	PCL-2553
B	▲2	300						MMT-4502	
C5	4	15NP	925391	NP-PRS50	BBR8-150 †	TC504	TD-8-150 †	MT-1508 †	R2444 *
				V4 BBR8-150			TD-8-150	MT-1508	

* Non-catalog item. † Connect negative leads together.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	EMERSON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C6	.47	200	924355	P288N-47		CUB2P47	GEM-2047	2TM-P47	
C7	1000		928919	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C8	24		928960						N330 5%
C9	68		928909	NPO-DI 68	DD-680	L10Q68		MS-468	10%
C10	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C11	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C12	330		928905		D6-331	L10T33		MS-333	10%
C13	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C14	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C15	330		928905		D6-331	L10T33		MS-333	10%
C16	4700		928923	BPD-0047	DD-472	BYA10D47	UC-5247	5GA-D47	
C17	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C18	1000		928911			1R5D1	MCB255	MS-21	10%
C19	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C20	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C21	8.2		928887	NPO-DI 8.2		C10V82C			
C22	6.8		928886	NPO-DI 6.8	DTZ-6R8	C10V68C	ZT-5568	5TCCB-V47	
C23	47		928895	N750-DI 47	DTN-47	C10Q47U	NT-5447	5TCU-Q47	N750 10%
C24	220		928904		D6-221	L10T22		MS-322	10%
C25	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C26	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C27	47		928895	N750-DI 47	DTN-47	C10Q47U	NT-5447	5TCU-Q47	N750 10%
C28	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C29	.047	200	921354	P288N-047	DF-503	CUB2S47	GEM-4147	2TM-S47	
C30	10000		928924	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C31	10000		928924	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C32	470		928916	BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C33	10000		928924	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C34	4700	1000	928954	HVD-15-4700	DD-472	BYA10D47		5GA-D47	
C35	470		928916	BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C36	10000		928924	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C37	10000		928924	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C38	3300		928958			1R5D33		MS-233	10%
C39	470		928916	BPD-00047	DD-471	BYA10T47	UC-5347	5GA-T47	
C40	4.7		928884			C10V47U			N750①
C41	10000		928924	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C42	1000		928919	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C43	2200		928921	BPD-00022	DD-222	BYA10D22	UC-5222	5GA-D22	
C44	.0047	400	924453				GEM-16247		10%
C45	1000		928933	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C46	.12	400	924418						10%
C47	.1	400	921515	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C48	.01	400	924514	P488N-01	D6-103	CUB4S1	GEM-411	4TM-S1	
C49	680		928917	BPD-00068	D6-681	BYA10T68	UC-5368	5GA-T68	
C50	680		928917	BPD-00068	D6-681	BYA10T68	UC-5368	5GA-T68	
C51	1000	1000	928959	HVD-15-1000	DD-102	BYA10D1M	DC3021	5GA-D1	
C52	3300		928958			1R5D33		MS-233	10%
C53	1000		928919	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C54	.015	200	924320	P288N-015	DD16-153	CUB6S15	GEM-4115	4TM-S15	
C55	100		911161	1469-0001	D6-101	22R5T1	MCB235	MS-31	10%
C56	.0047	400	921453				GEM-16247		10%
C57	220		911165	1469-00022	D6-221	22R5T22		MS-322	10%

CAPACITORS (cont)

ITEM No.	RATING CAP	RATING VOLT	REPLACEMENT DATA: EMERSON PART No	AEROVOX PART No	CENTRALAB PART No	CORNELL-DUBILIER PART No	MALLORY PART No	SPRAGUE PART No	NOTES
C58	390		911165		DS-391	5R5T39		MS-339	10%
C59	4700		928922	BPD-0047	DD-472	BYA10D47	UC-5247	5GA-D47	
C60	.1	400	924515	P488N-1	DF-104	CUB42P	GEM-401	47M-P1	
C61	.01	400	923514	P488N-01	DS-106	CUB48I	GEM-411	47M-S1	
C62	.1	600	924715	P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	
C63	.033	600		P688N-033	DF-303	CUB6S33	GEM-6133	6TM-S33	③
C64	180	4000	928965						10%
C65	68	3000	928765						10%

① Not used in some versions. ③ Some versions use .047mfd 3000V in this application (Part #924654).

CONTROLS

ITEM No	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA: EMERSON PART No	CENTRALAB PART No	CLAROSTAT PART No	IRC PART No	MALLORY PART No	INSTALLATION NOTES
R1A	600Ω	½	390581 ①	F3-2	RTV-672		■ UE38325	Contrast
B	Imeg	½		R2-52	Not Req.			Volume
C	Switch			KB-2 or KR-2*	Not Req.			
A	600Ω	½	390538 ③		RTV-653		UE1198	Contrast
B	Imeg	½			Not Req.		Not Req.	Volume
C	Switch				Not Req.		Not Req.	Push-Push
R2A	300K	½	390408	B-46	A47-300K-8	QU-129	U43	Brightness
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R3A	1.5meg	½	390472	B-742	A47-1.5meg -G	QU-138	U155	Vert. Hold
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R4A	50K	½	390410	B-31	A47-50K-8	QU-123	U36	Horiz. Hold
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R5	1500Ω	½	390461					Vert. Lin.
R6	2meg	½	390403					Vert. Size
R7	200K	½	390475					Horiz. Balance
R8	30Ω	1(WW)	390544		39-50		FL-500	Horiz. Drive
R9A	5meg	½	390497	AB-87	A47-5meg-8	BU-141	PTA56L	Local-Distant
B	Shaft			AK-1	FKH-1/4	SK3	Not Req.	

* Use KR with CRL "red label" controls and KB with "blue label" controls.
■ "TA-LOC" Equivalent : FD838, OF1037, RU16A, HF3750, U843.
① Used in Ch. 120417S, 418U.
③ Used in Ch. 120407S, 406U, 430S, 431U, 432S, 423S.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	EMERSON PART No.	NOTES
R10	1.5meg		341252	
R11	22K		340812	
R12	1000Ω		340492	
R13	150K		341012	
R14	22K		340812	
R15	470Ω		350412	
R16	56Ω		340192	
R17	12K		340752	
R18	100K		340972	
R19	100K		340972	
R20	470Ω		350412	
R21	56Ω		340192	
R22	470Ω		350412	
R23	33K		340852	
R24	180Ω		340312	
R25	1500Ω		350532	
R26	15K		340772	
R27	4700Ω		340652	
R28	15K	1	370772	
R29	560Ω		340432	
R30	15Ω		340052	
R31	33K		340852	
R32	2200Ω		340572	
R33	5000Ω	4	397112	
R34	150K		341012	
R35	10K		340732	
R36	2700Ω		340592	
R37	100K		340972	
R38	150K		341012	
R39	560K		341152	
R40	12K	2	780755	
R41	560Ω		340432	
R42	470K		351132	
R43	470Ω	1		Note 1
R44	470K		341132	
R45	15meg		351492	
R46	470K		341132	
R47	2.2meg		351292	
R48	120K	1	370992	
R49	82K		340952	
R50	47K		340892	
R51	470K		341132	
R52	39K		340872	
R53	10K		350732	

ITEM No.	RATING OHMS	RATING WATT	EMERSON PART No.	NOTES
R54	2.2meg		351292	
R55	220K		351052	
R56	22K		340812	
R57	470K		341132	
R58	82K		340952	
R59	390K		341112	
R60	1meg		351212	
R61	100K		340972	
R62	10K		340732	
R63	3300Ω		340612	
R64	3300Ω		340612	
R65	150K		341012	
R66	33K		340852	
R67	180K		341032	
R68	2.2meg		341292	
R69	2.2meg		341292	
R70	220Ω		340332	
R71	2.2meg		351292	
R72	100Ω		350252	
R73	82K		340952	
R74	22K		340852	Note 2
R75	560Ω		340432	
R76	560Ω		340432	
R77	100K		340972	
R78	100K		340972	
R79	82K	1	370952	
R80	68K		340932	
R81	10meg		351452	
R82	2.2meg		351292	
R83	1200Ω		340512	
R84	15K		340772	
R85	47K		340892	
R86	120K		340992	
R87	68000Ω		340692	
R88	470K		341132	
R89	47K		340892	
R90	100Ω		350252	
R91	8200Ω	2	780712	
R92	8200Ω	1	370712	
R93	10K		340732	
R94	3900Ω	7	394183	
R95	470Ω	2	780412	
R96	1000Ω	2	780492	
R97	470K		351132	

Note 1. Some versions may use 270Ω 1W in this application. Note 2. Some versions may use 33K in this application.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA: EMERSON PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	41.25MC Trap	706213					
L2A	1st. Video IF	720289					
B	47.25MC Trap						
L3	2nd. Video IF	720238	17-4523 *	TV-130 *	6219 *	VF-3 *	
L4	3rd. Video IF	720238	17-4522 *	TV-130 *	6219 *	VF-3 *	
L5	4th. Video IF	720247	17-4523 *	TV-130 *	6219 *	VF-3 *	
L6	RF Choke	705024	19-1004	BC-565	4610		6.8 Microhenries
L7	RF Choke	705014	19-8022	TV-180	6182		20 Microhenries
L8	Series Peaking Coil	708090	19-3075	TV-186	6172	VP-2	80 Microhenries
L9	Shunt Peaking Coil	708279	19-3500	TV-203	6174	VP-8	500 Microhenries
L10A	4.5MC Trap	720297					
B	1st. Sound IF						
L11	Series Peaking Coil	708273	19-4400	TV-202	6136		440 Microhenries
L12	Shunt Peaking Coil	708336	19-4050	TV-208	6157		1 Millihenry
L13	Shunt Peaking Coil	708335	19-3300	TV-199	6155		300 Microhenries
L14	2nd. Sound IF	720298					
L15	Quadrature Coil	720299					
L16	RF Choke	705021	19-1006	BC-566	4612		10 Microhenries

* Drill new mounting hole.

PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES PRI.	DC RES SEC.	REPLACEMENT DATA: EMERSON PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	Thordarson PART No.	NOTES
L17	43Ω		716121						

FILTER CHOKE

ITEM No.	RATINGS CURRENT (Measured)	RATINGS DC RES.	RATINGS INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA: EMERSON PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L18	.250A	20Ω	53 Hy.	737036	C5041 ①		F-801 ①	C-2328 ①	26C92 ①	C-27X

① Drill new mounting hole.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA: EMERSON PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V	540VCT @ .300A	5V @ 2.7A	730078						
	SEC. 3	SEC. 4	SEC. 5							
	6.3V @ 8.7A									

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA: EMERSON PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	Vert. Output	738153	21900①	A-3036	V307	A-8144	26S18 ② Y-53 ③	A-108X	
T3A	Yoke-Horiz.(21MH)	708330							
B	(10°)-Vert.(32MH)								
	Rear Cover & Centering Device	708340							
	Yoke Clamp	412864							
T4	Horiz. Output	738154							
T5	Width Coil (4-25MH)	708342	RF800④	MWC-12	20LR10	WC-18	WC-20 ⑤	WLC-3	

① Use 8 : 1 turns ratio.
② Drill new mounting hole(s).
③ Connect same as original. Use original rear cover, centering device and damping network.
④ Use red and blue terminals.
⑤ Use terminals #3 and #4.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA: EMERSON PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T8	4800Ω	6-8Ω Tap ② 3-4Ω	734163							

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	V. C. IMP.	REPLACEMENT DATA: EMERSON PART No.	QUAM PART No.	NOTES
SP1	5"x 7"	PM	3-4Ω	180173 ①	57A21	① Used in Models 1440, 1441
SP2	5"x 7"	PM	3-4Ω	180173 ①	57A21	② Used in Models 1436, 1439, 1440, 1441
SP3	4"	PM	4-8Ω	180174 ②	4A15T24.8	③ Used in Models 1414, 1415
SP4	4"	PM	4-8Ω	180174 ②	4A15T24.8	④ Used in Models 1432, 1433, 1434, 1438
	6"	PM	3-4Ω	180170 ③	6A1	⑤ Used in Models 1436, 1439
	6"	PM		180171 ④		
	4"x 6"	PM		180179 ④		

RECTIFIERS

ITEM No.	RATING CURRENT (Measured)	REPLACEMENT DATA: EMERSON PART No.	FEDERAL PART No.	GENERAL ELECTRIC PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	NOTES
M1		617062	K1616		BD-81 ①		① Silicon

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA: EMERSON PART No. FUSE	EMERSON PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M2	N	6/10A 125V 8/B	808015		333.600 (N 6/10A-125V-8/B)	346010	N 6/10	HV 1/2 to 3/4
M3	#26 Wire 2" Length							

MISCELLANEOUS

ITEM No.	PART NAME	EMERSON PART No.	NOTES
M4	Tuner	471080	VHF, Ch. 120407S, 417B, 432S
	Tuner	471096	VHF, Ch. 120420S
	Tuner	471081	VHF With UHF Provisions, Ch. 120408U, 418U, 423U
	Tuner	471097	VHF With UHF Provisions, Ch. 120421U
	Tuner	471037	UHF , Ch. 120408U, 418U, 420U, 423U
M5	Centering Device	708340	Includes yoke rear cover
	Printed Board	630321	Video, AGC, Sound & Sync
	Printed Board	630320	Sync, Horiz. & Vert.

WIRING DATA

High Voltage Lead	Use BELDEN No. 8889
Shielded Hook-up Wire	Use BELDEN No. 8885 (Single Conductor) 8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8534 (Stranded) Available in Ten Colors
Power Cord (Interlock Type)	Use BELDEN No. 8874
300Ω Tuner Input Lead	Use BELDEN No. 8225
300Ω Antenna Lead-In	Use BELDEN No. 8230 or 8275
Antenna Rotor Cable	Use BELDEN No. 8484 (Flat) or 8484 (Round) - 4 Conductor 8485 (Round) - 5 Conductor 8488 (Round) - 8 Conductor

RADIO PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No	USE	TYPE	NOTES
V17	FM RF Amp.	12BA6	
V18	FM Mixer-Osc.	12AT7	
V19	AM Conv.	12BE6	
V20	1st. FM AM IF Amp.	12BA6	

ITEM No	USE	TYPE	NOTES
V21	2nd. FM IF Amp.- AM Det.	12BA6	
V22	Ratio Det.-AF Amp.	19T8	
V23	Audio Output	35C5	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA: EMERSON PART No	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No	PYRAMID PART No	SANGAMO PART No	SPRAGUE PART No
C66A	80	150	925433		PR6-480	BBRD8515	TCT3118	T-057	R2207 *
B	50	150				BR5015		MT-1530	
C	50	150							
C67	8	50	925434		PR850V2	BBR2-50	TT150X3	MT-0502	TVA-1301
C68	50	25	925433		PR825V50	BBR50-25	TC39	TD-50-25	MT-0250	TVA-1306

* Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA: EMERSON PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C69	47	1400	928969						N330
C70	10	1400	928968						NPO 10%
C71	47		928880						N330 10%
C72	1000			EF-001	MFT-1000			503C-D1	
C73	1000			EF-001	MFT-1000			503C-D1	
C74	1500			BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	
C75	80								NPO 10%
C76	9.5								N30 10%
C77	1000			EF-001	MFT-1000			503C-D1	
C78	2200		928821	BPD-0022	DD-222	BYA10D22	UC-5222	5HK-D22	
C79	5		928967						N1400 10%
C80	.033	400	923534	P488N-033	DF-303	CUB4S33	GEM-4133	47M-S33	
C81	10000		928924	BPD-01	DD-103	BYA5S1	DC511	5HK-S1	
C82	4700		928922	BPD-0047	DD-472	BYA10D47	UC-5247	5GA-D47	
C83	220		928914	BPD-00022	DD-221	L10T22	UC-5222	5GA-T22	
C84	2200		928921	BPD-0022	DD-222	BYA10D22	UC-5222	5GA-D22	
C85	100		928912	BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C86	1000		928919	BPD-001	DD-102	BYA5D1	DC521	5HK-D1	
C87	6.8		928803						5%
C88	2200		928921	BPD-0022	DD-222	BYA10D22	UC-5222	5GA-D22	
C89	.05	600	923754	P688N-05	DF-503	CUB6S5	GEM-615	6TM-S5	
C90	.05	600	923754	P688N-05	DF-503	CUB6S5	GEM-615	6TM-S5	
C91	33		928894	N750-DI 33	DN-33	CD6Q33U		5TCU-Q33	N750 10%
C92	4700		928922	BPD-0047	DD-472	BYA10D47	UC-5247	5HK-D47	
C93	4700		928922	BPD-0047	DD-472	BYA10D47	UC-5247	5HK-D47	
C94	4700		928922	BPD-0047	DD-472	BYA10D47	UC-5247	5HK-D47	
C95	10000		928924	BPD-01	DD-103	BYA5S1	DC511	5HK-S1	
C96	220		928914	BPD-00022	DD-221	L10T22	UC-5222	5GA-T22	
C97	.033	400	923534	P488N-033	DD-303	CUB4S33	GEM-4133	47M-S33	
C98	1500			BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	
C99	1500			BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	
C100	2200		928921	BPD-0022	DD-222	BYA10D22	UC-5222	5GA-D22	
C101	2200		928921	BPD-0022	DD-222	BYA10D22	UC-5222	5GA-D22	
C102	2200		928921	BPD-0022	DD-222	BYA10D22	UC-5222	5GA-D22	
C103	.047	600	922206	P688N-047	DF-503	CUB6S47	GEM-6147	6TM-S47	

CONTROLS

ITEM No	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA: EMERSON PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No	INSTALLATION NOTES
R98A	2meg	½	390552	BT-79	A47FS-2meg		UT-454	Volume, Tap ② 300K
B	Shaft			Not Req.	FS-3		Not Req.	
C	Switch			KB-2 or KR-2*	SWE-20		US-27	
R99A	500K	½	390538	B-59	A47-500K-8	QU-133	U50 *	Tone
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	

* Use KR with CRL "red label" controls and KB with "blue label" controls.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	EMERSON PART No	NOTES
R100	470K		351132	
R101	470K		351132	
R102	470K			
R103	330Ω			
R104	100Ω			
R105	10K			
R106	330Ω			
R107	470K			
R108	330Ω		350372	
R109	22K		340812	
R110	330Ω		350372	
R111	3.3meg		351312	
R112	470K		351132	

ITEM No.	RATING OHMS	RATING WATT	EMERSON PART No	NOTES
R113	330Ω		350372	
R114	33K		340852	
R115	2.2meg		351292	
R116	22K		340812	
R117	47K		350892	
R118	4.7meg		351372	
R119	220K		35105 2	
R120	470K		351132	
R121	150Ω		340292	
R122	560Ω	7	397119	
R123	330Ω	1	380372	
R124	22Ω		397121	
R125	68K		340932	Note 1

Note 1. Not used in some versions.

EMERSON MODELS 1414, 1415, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 120397S, 120407S, 120408U, 120417S, 120418U, 120419S, 120420S, 120421U, 120423S, 120432U)

FOLDER 1

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		EMERSON PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L19	FM Ant. Coil	710034	19-1000	BC-561	4602		1 Microhenry
L20	FM RF Coil	†					
L21	FM Osc. Coil	†					
L22	Loop Stick	700134					
L23	AM Osc. Coil	716122					Tapped @ .4Ω
L24	1st. FM IF	720307	16-3487	FM-254	1463		
L25	1st. AM IF	720075	16-6758	BC-352	12-C1	RF-1	
L26	2nd. FM IF	720307	16-3487	FM-254	1463		
L27	2nd. AM IF	720075	16-6758	BC-353	12-C2	RF-2	
L28	Ratio Detector	708341	17-3498	FM-255	1465		
L29	Fil. Choke	705029	19-1002	BC-563	4606		2.2 Microhenries

† Part of M11 (FM Tuner Assy. #471064).

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	EMERSON PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T7	2700Ω	6-8Ω	734164	Z1001 ①	A-2902 ①	AU-604①	A-3849 ①	24S64 ①	S-53X ①	① Drill new mounting hole.

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
	CURRENT (Measured)	EMERSON PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M6	.081A	817072 ①	1235AH ①	T100 ① SD-92 ②	100A ① K200 ②	① Selenium Type. ② Silicon Type.

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	EMERSON PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M7	961865	55-T or 81-TB	GD-J			

ASTATIC NEEDLE LISTING SHOWN ABOVE IS SPECIFIED FOR THE RESPECTIVE REPLACEMENT CARTRIDGE LISTED. FOR ORIGINAL CARTRIDGE NEEDLE REPLACEMENTS SEE BELOW.

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	EMERSON PART No.	JENSEN PART No.	WALCO PART No.	
M8	960287	†S-66 or †♦S-66SD or ♦S-66D	†W-75TPS or †♦W-75DS or ♦W-75TPD	† Jewel ♦ Diamond

MISCELLANEOUS

ITEM No.	PART NAME	EMERSON PART No.	NOTES
M9	Lamp		NE51, Not used in some versions
M10	Tuning Cap.	900175	2 Gang (Ant. 11-228mmf, Osc. 12-115mmf)
M11	Tuner	471064	FM Assy.
M12	Switch	510133	AM-FM-Phono (Rotary wafer type)

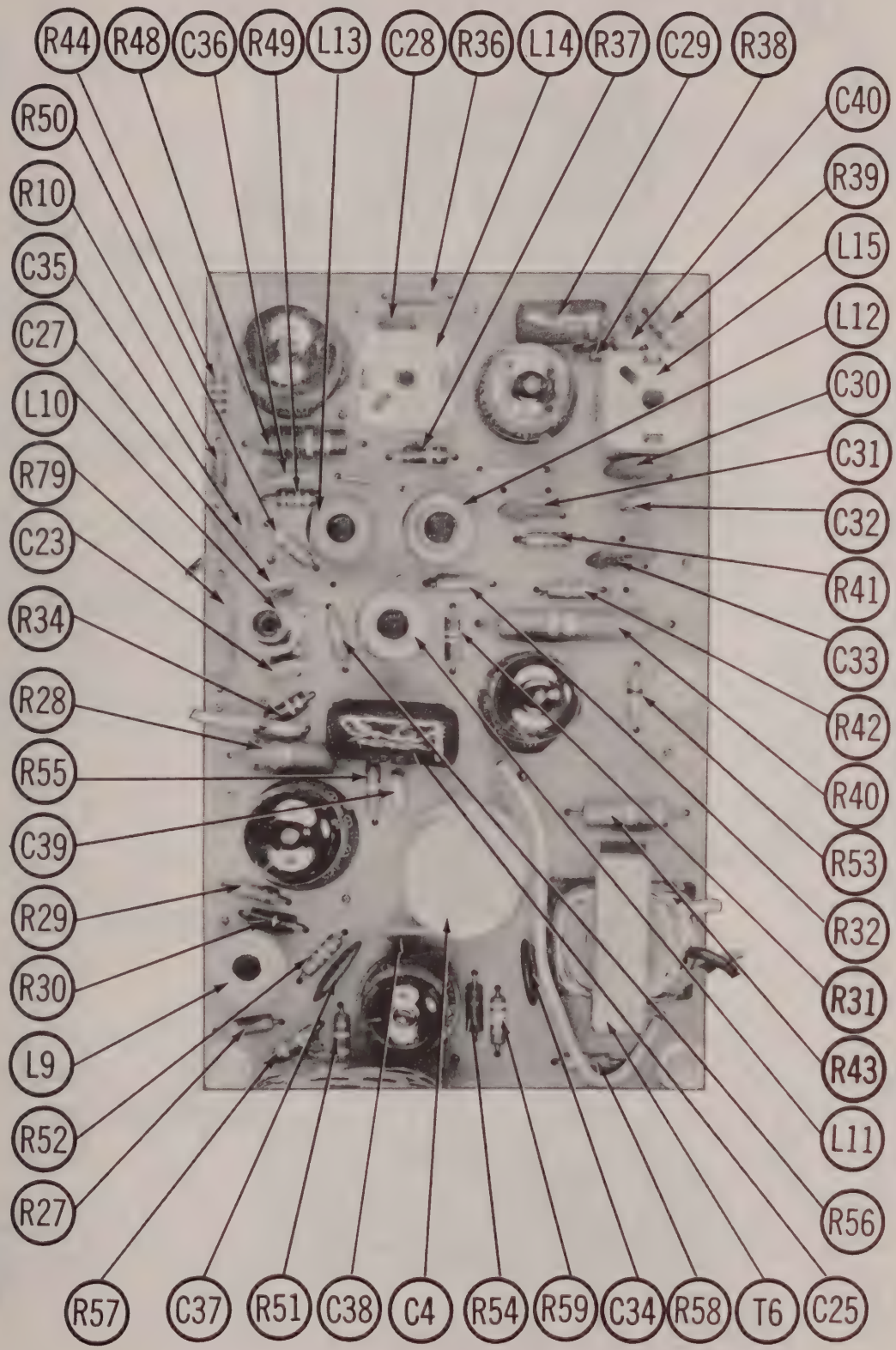
CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Safety Glass	520261	
Mask	460933B	Models 1414, 1415, 1438, 1439, 1440, 1441, 1432, 1433
Mask	461003A	Models 1434, 1435
Knob	460923B	UHF Tuning, Models 1415, 1433, 1435
Knob	460923A	UHF Tuning, Models 1439, 1441
Knob	460918B	VHF Fine Tuning, Models 1414, 1415, 1432, 1433, 1434, 1435
Knob	460918A	VHF Fine Tuning, Models 1440, 1439, 1438, 1441
Knob	460920A	Channel Selector, Models 1438, 1440
Knob	460920B	Channel Selector, Models 1414, 1432, 1434
Knob	460928A	Channel Selector, Models 1439, 1441
Knob	460928B	Channel Selector, Models 1415, 1433, 1435
Knob	460921A	UHF Dial, Models 1439, 1441
Knob	460921B	UHF Dial, Models 1415, 1433, 1435
Knob	460922A	On-Off-Volume, Models 1414, 1415, 1432, 1433, 1434, 1435
Knob	460979	On-Off-Volume, Models 1438, 1439, 1440, 1441
Knob	460980	On-Off-Volume, Treble-Bass, Models 1438, 1439
Knob	460997	Volume-Tone, Models 1440, 1441
Knob	460919A	Contrast, Models 1438, 1439, 1440, 1441
Knob	460919B	Contrast, Models 1414, 1415, 1432, 1433, 1434, 1435
Knob	460713C	Brightness, Vert., Horiz. Hold
Knob	460999	Radio Tuning, Models 1440, 1441
Knob	460832	Radio Tuning, Models 1438, 1439
Knob	460998	AM-FM-Phono, Models 1440, 1441
Knob	460835	Phono-Radio, Models 1438, 1439
Legs	620319	Models 1440, 1441
Legs	620301	Models 1438, 1439

WIRING DATA

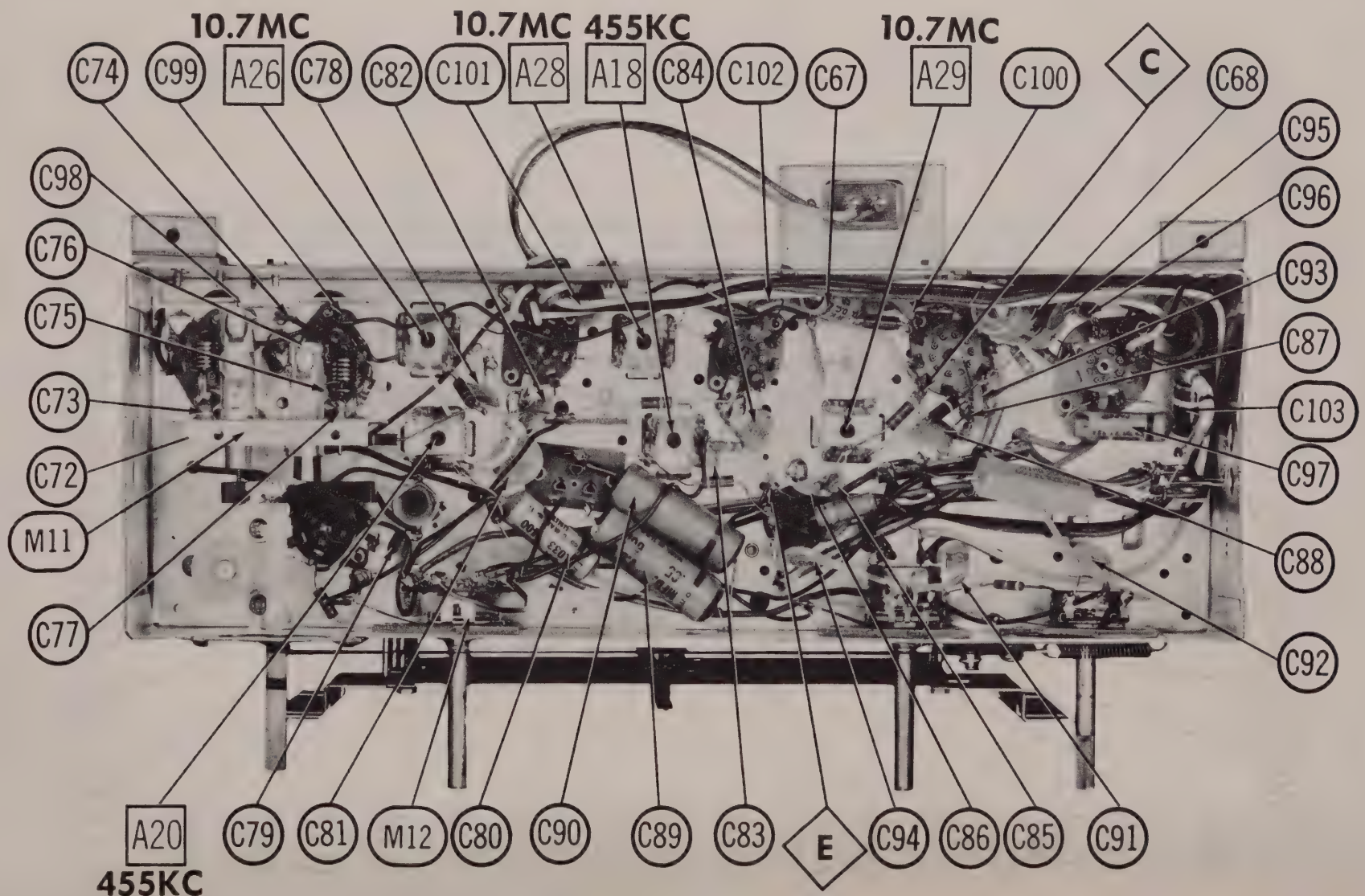
General-use Unshielded Hook-up Wire.....Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors
Power Cord (Interlock Type) ..... Use BELDEN No. 8874
Low-Loss Shielded Lead (Interconnecting)..... Use BELDEN No. 8401
Phono Pick-up Arm Cable .....Use BELDEN No. 8430 (Two Conductor - Twisted)



SYNC, HORIZ & VERT PRINTED BOARD

EMERSON MODELS 1414, 1415, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 1203978, 1204075, 1204080, 1204175, 1204180, 1204198, 1204205, 1204210, 1204225, 1204230)

FOLDER 1



RADIO CHASSIS BOTTOM VIEW - CAPACITOR & ALIGNMENT IDENT

ALIGNMENT INSTRUCTIONS (cont)

AM ALIGNMENT FOR FM-AM RADIO #120419-B

Use isolation transformer, if available. If not, connect a .1mfd capacitor in series with low side of signal generator and chassis.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
9.	.25mfd	High side to AM antenna stator lug (rear section of tuning gang). Low side to chassis.	455KC (400∿ Mod)	AM	Tuning gang fully open	Across Voice Coil	A18, A19, A20, A21	Adjust for maximum output.
10.	Direct	Loop	600KC	"	600KC	"	A22	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.
11.	"	"	1638KC	"	Tuning gang fully open	"	A22	"
12.	"	"	1420KC	"	Tune 1420KC signal	"	A24	"

FM ALIGNMENT USING AM SIGNAL GENERATOR AND VTVM

Connect two matched 100K (±1%) resistors in series from point Ⓒ to chassis. The junction of these two resistors is alignment point Ⓓ as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
13.	Direct	High side to ungrounded tube shield floating over FM Mixer-Osc. (12AT7) V18B. Low side to chassis thru .25mfd capacitor.	10.7MC (Unmod)	FM	Fully counter-clockwise.	DC probe to point Ⓒ. Common to chassis.	A25, A26, A27, A28, A29	Adjust for maximum deflection.
14.	"	"	"	"	"	DC probe to point Ⓔ. Common to point Ⓓ.	A30	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

FM ALIGNMENT USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
13.	Direct	High side to ungrounded tube shield floating over FM Mixer-Osc. (12AT7) V18B. Low side to chassis thru .25mfd.	10.7MC (450KC Swp)	FM	Fully counter-clockwise.	Vert. Amp. to point Ⓒ. Low side to chassis.	A25, A26, A27, A27, A29	Disconnect ungrounded lead of stabilizing capacitor (C67). Adjust for maximum gain and symmetry of response similar to Fig. 2 with markers as shown. Reconnect C67.
14.	"	"	"	"	"	Vert. Amp. to point Ⓔ. Low side to chassis.	A30	Adjust so that the 4.5MC marker occurs at the center of the crossover lines as in Fig. 3. SLIGHTLY retouch A29 for maximum amplitude and straightness of crossover lines.

TUNER ALIGNMENT INSTRUCTIONS LOCATED ON PAGE 6.

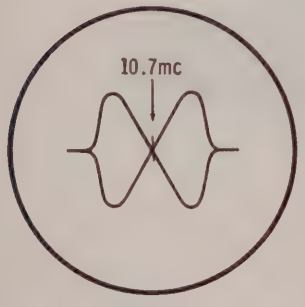


FIG. 2

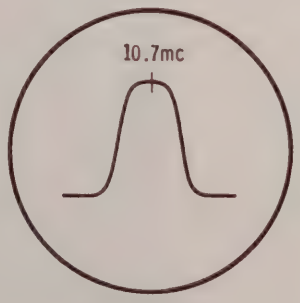
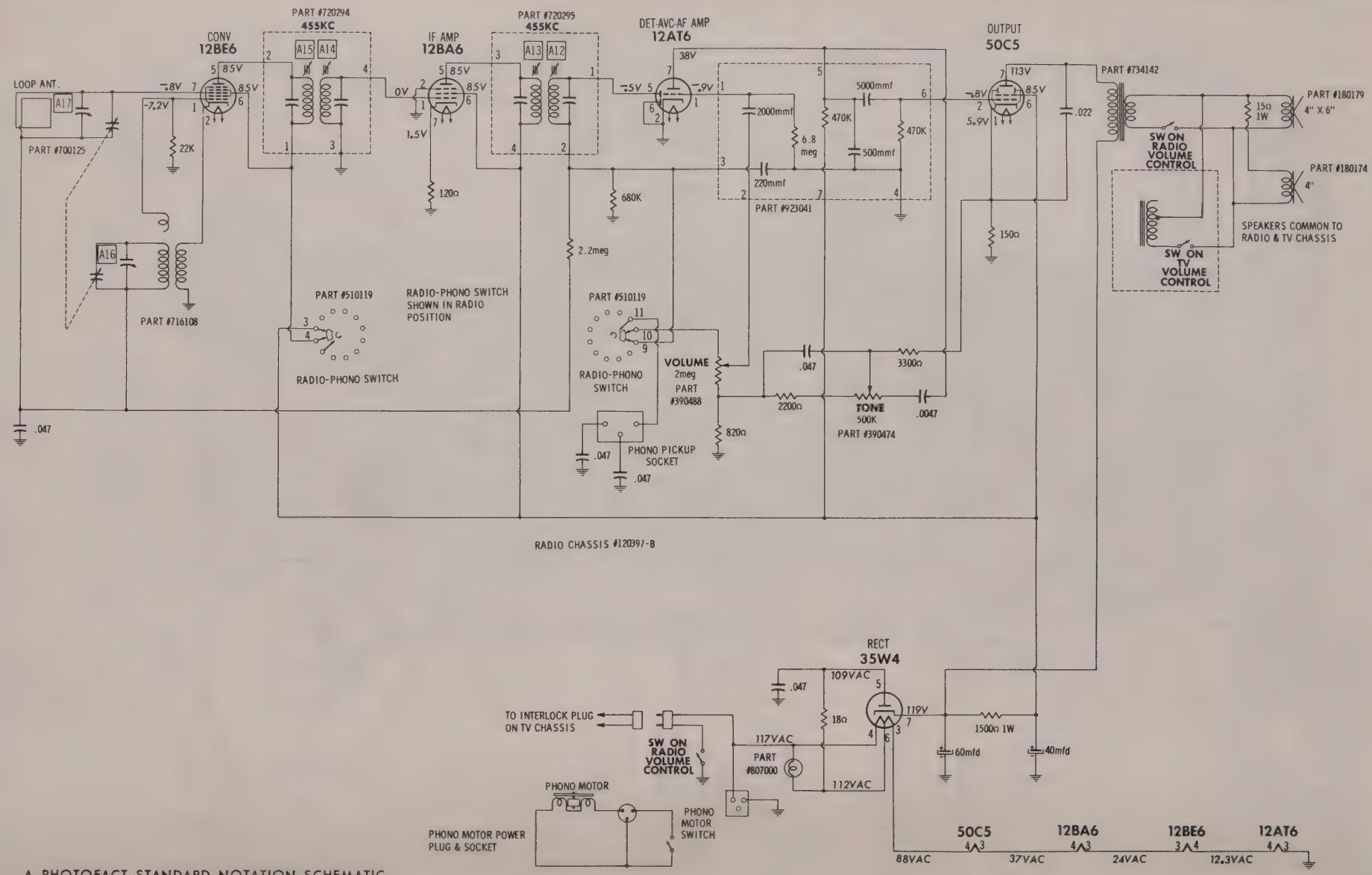


FIG. 3



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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RADIO CHASSIS 120397B

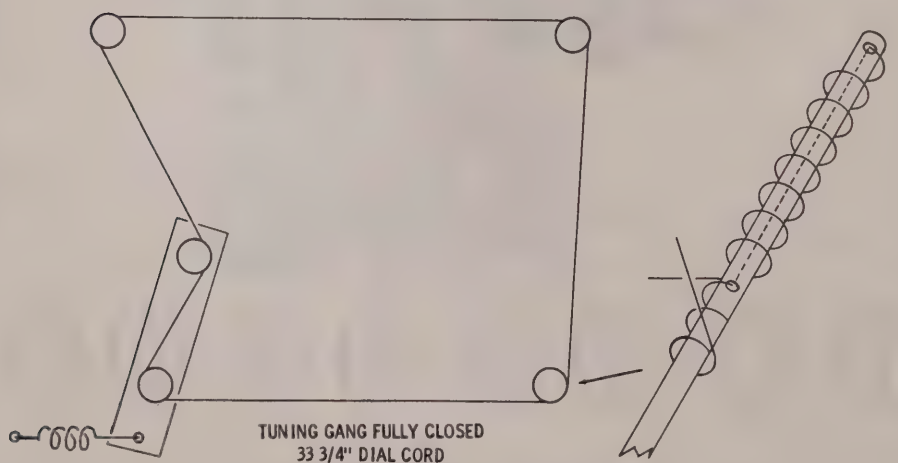
RF TUNER

EMERSON MODELS 1414, 1415, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 1203978, 1204075, 1204080, 1204175, 1204180, 1204190, 1204205, 1204210, 1204225, 1204230)

RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6CB6	130K	56Ω	.1Ω	0Ω	▲470Ω	▲470Ω	0Ω		
V2	6CB6	50K	▲56Ω	.1Ω	0Ω	†960Ω	†960Ω	INF		
V3	6AS8	†33K	.1Ω	180Ω	.1Ω	0Ω	4700Ω	0Ω	.1Ω	†1500Ω
V4	12BY7A	• 200Ω	4700Ω	0Ω	0Ω	0Ω	.1Ω	†5000Ω	†15K	0Ω
V5	6AN8	†100K	2.2Ω	2700Ω	.1Ω	0Ω	570K	ǂ120K	†52K	†490Ω
V6	6DT6	7.4Ω	560Ω	.1Ω	0Ω	†470K	†12K	560K		
V7	6AQ5	0Ω	470Ω	0Ω	.1Ω	†1300Ω	†1000Ω	0Ω		
V8	6BY6	330K	0Ω	0Ω	.1Ω	†70K	†22K	2.2meg		
V9	6CG7	•ǂ2.8meg	• 440K	0Ω	.1Ω	0Ω	†17K	†1meg	3300Ω	0Ω
V10	6W6GT	NC	.1Ω	†390Ω	†22K	2.2meg	TP	0Ω	• 600Ω	
V11	6CG7	†120K	•110K	1200Ω	0Ω	.1Ω	†15K	2meg	1200Ω	0Ω
V12	6DQ6A	TP	.1Ω	NC	†8700Ω	470K	TP	0Ω	•25Ω	TOP CAP ǂ14Ω
V13	6DA4	NC	NC	¶ 200K	NC	†27Ω	NC	0Ω	.1Ω	
V14	1B3GT		PINS	1 THRU 8	HAVE	INF	RESISTANCE			TOP CAP ǂ 554Ω
V15	5U4GB	NC	¶	NC	24Ω	NC	23Ω	NC	¶	
V16	21DAP4	.1Ω	10K	ǂ22Ω	†20Ω	NC	NC	•190K	0Ω	
V17	12BA6	470K	0Ω	0Ω	12Ω	††1300Ω	††1600Ω	0Ω		
V18	12AT7	††1200Ω	10K	0Ω	12Ω	24Ω	††1200Ω	470K	0Ω	18Ω
V19	12BE6	▲22K	▲.4Ω	55Ω	43Ω	††▲900Ω	††▲890Ω	▲3.7meg		
V20	12BA6	3.7meg	0Ω	55Ω	67Ω	††1200Ω	††1200Ω	0Ω		
V21	12BA6	470K	0Ω	67Ω	79Ω	††1200Ω	††1200Ω	0Ω		
V22	19T8	1meg	22K	1meg	24Ω	43Ω	0Ω	0Ω	4.7meg	††220K
V23	35C5	150Ω	470K	79Ω	110Ω	470K	††560Ω	††145Ω		
V201	6BN4	0Ω	1.6meg	0Ω	.1Ω	†4900Ω	0Ω	1.6meg		
V202	6CG8	10K	†9500Ω	0Ω	0Ω	.1Ω	†4900Ω	†14K	0Ω	230K
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9

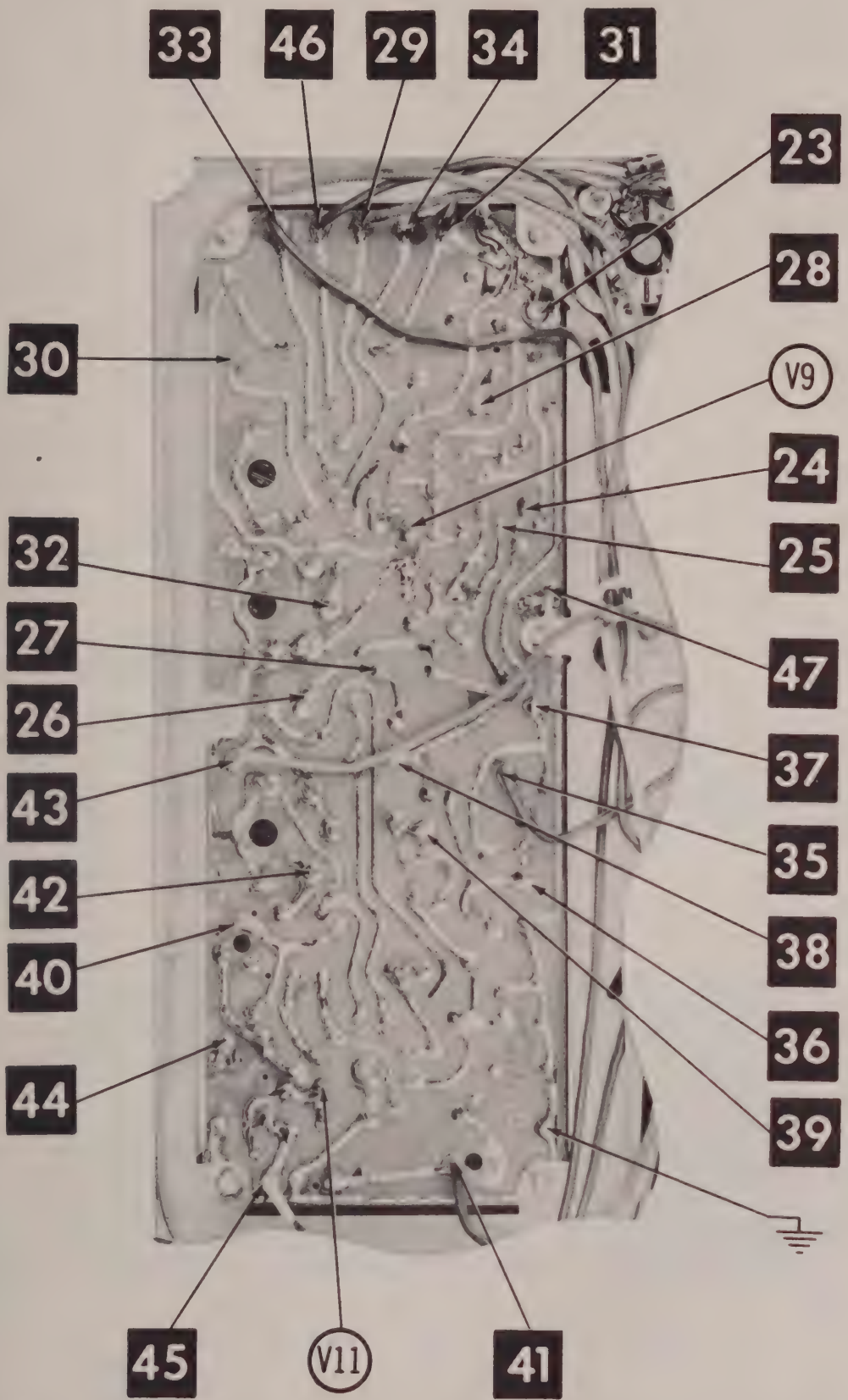
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
• THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION.
▲ MEASURED IN "AM" POSITION.
▲ MEASURED FROM PIN 7 OF V2. †† MEASURED FROM OUTPUT OF M6.
† MEASURED FROM 265V SOURCE. NC NO CONNECTION.
ǂ MEASURED FROM PIN 3 OF V13. TP TIE POINT
ALL RADIO MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.



TUNING GANG FULLY CLOSED
33 3/4" DIAL CORD

DIAL CORD STRINGING

CircuiTrace Numbers 23 thru 47



A Howard W. Sams CIRCUITRACE* Photo
*TRADE MARK

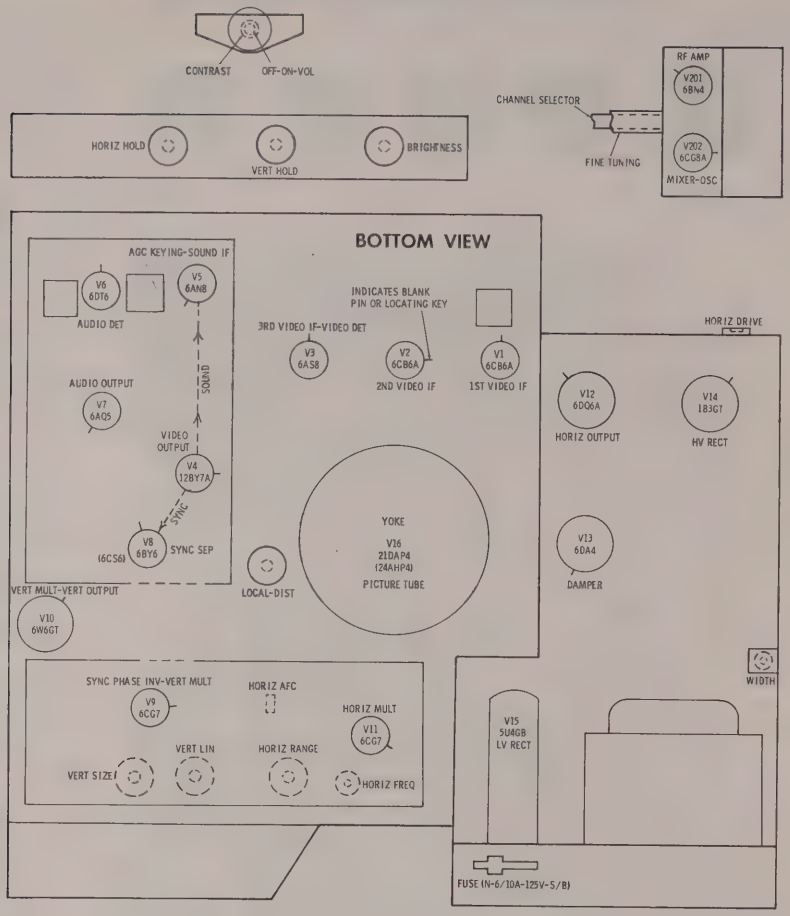
SYNC, HORIZ & VERT
PRINTED BOARD

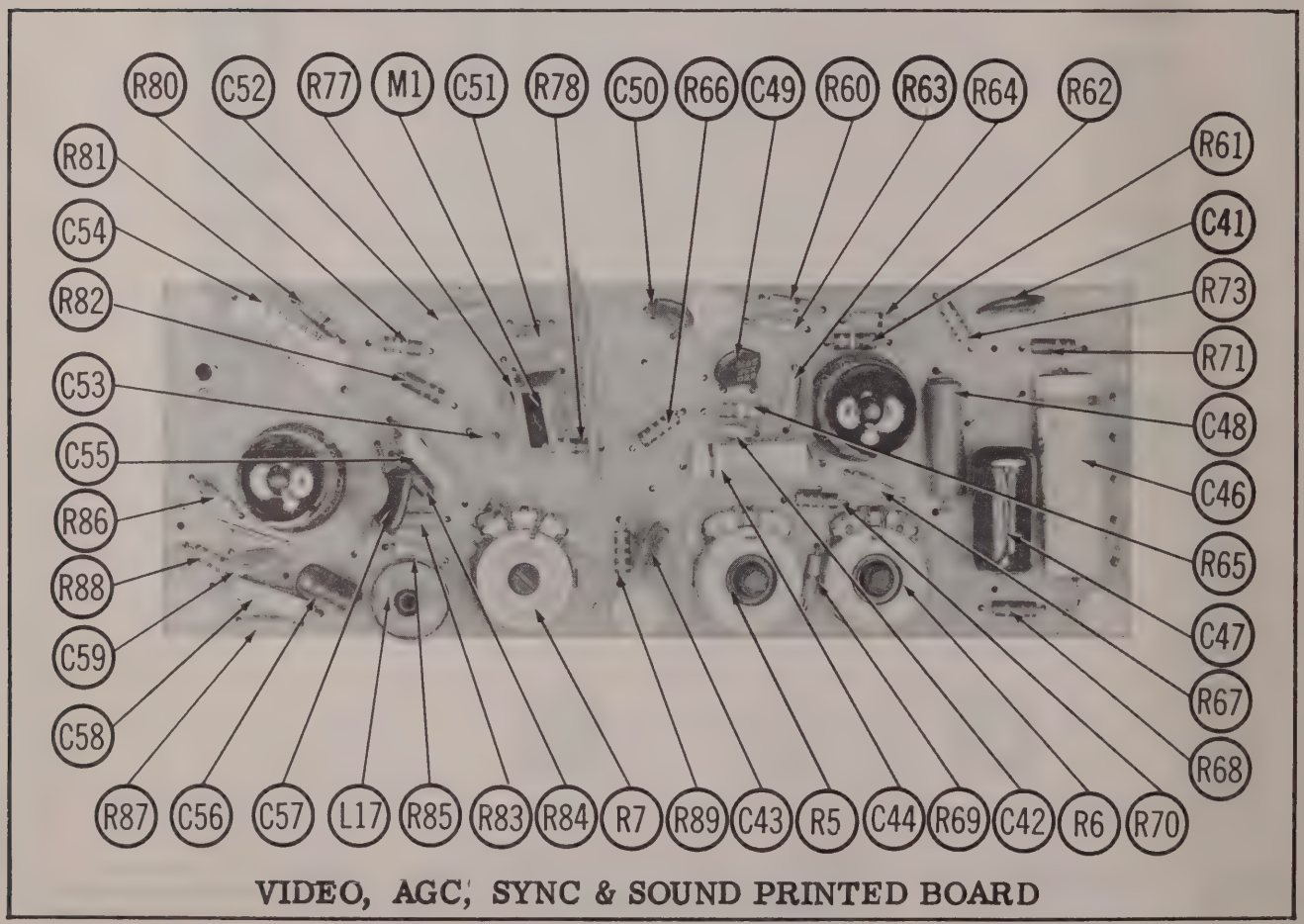
ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED

EMERSON MODELS 1414, 1415, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 120397B, 120407S, 120408U, 120417S, 120418U, 120419B, 120420S, 120421U, 120422S, 120423U)

FOLDER 1

TUBE PLACEMENT CHART





VIDEO, AGC, SYNC & SOUND PRINTED BOARD

CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

1. Tune in a good TV signal and turn Local-Distance (R9) fully clockwise.
2. Place a jumper across C56 which is in parallel with the Horizontal Frequency coil. Connect a clip lead from pin 7 (grid) of the Hori - zontal Multivibrator (V11) to chassis.
3. Set the Horizontal Hold to the center of its range.
4. Adjust the Horizontal Balance (R7) until the picture falls into sync (it may sway back and forth).
5. Remove the short from C56 and adjust Horizontal Frequency slug (B1) for same sync condition as step 4.
6. Remove the short from the grid. The picture should be in sync.
7. Adjust the Drive (R8) as far clockwise as possible without the presence of drive lines.
8. Adjust Width slug (B2) for a picture SLIGHTLY wider than necessary to fill the picture mask horizontally.

DISASSEMBLY INSTRUCTIONS

MODEL 21T2425 (M4 Line)

CHASSIS REMOVAL

1. Remove 6 push-on type knobs from the front.
2. Remove 11 metal screws holding the rear cover. Remove the rear cover.
3. Remove the picture tube socket, yoke clamp, yoke, HV lead and speaker leads.
4. Remove 1 metal screw holding the top chassis support bracket to the front. (Located inside the cabinet.)
5. Remove 4 (5 in some versions) chassis bolts from the bottom.
6. Remove the chassis.

TRADE NAME	General Electric	MODELS
		17T2405, 17T2410, 17T2411, 17T2412, 21C2440, 21C2441, 21C2445, 21C2446, 21T2419, 21T2420, 21T2421, 21T2425, 21T2426 & UHF (M4 Line)
MANUFACTURER	General Electric Co., Applicance & Television Receiver Div., Louisville, Ky.	
TYPE SET	Television Receiver	
TUBES	Sixteen	
POWER SUPPLY	110-125 Volts AC, 60 Cycle	RATING 190 Watts, 1.74 Amp. @ 117 volts AC
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)	

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustment of the VHF Oscillator is possible by removing the Channel Selector and Fine Tuning knobs. Set the Fine Tuning at the center of its range. One slug for HIGH band adjustment is located at 3 o'clock, and should be adjusted first. The LOW band adjustment is located at 11 o'clock. Adjust for best picture and sound.

PICTURE TUBE SAFETY GLASS CLEANING

For picture tube, and safety glass cleaning, it is necessary to remove the chassis. (See disassembly instructions.)

FOCUS

No provision is made to vary the focus on this receiver. Some versions may be equipped with a Beam Alignment magnet. Adjust for best focus consistent with maximum brightness.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENTS

For adjustment of the Horizontal Oscillator, it is necessary to remove the rear cover and supply power to set. Set the Horizontal Hold at the center of its range and adjust the Horizontal Frequency slug (B1) until the picture synchronizes horizontally. (For location, see tube placement chart.)

SOUND IF DETECTOR BUZZ ADJUSTMENT

To eliminate intercarrier buzz, adjust the Ratio Detector secondary (A10) located on top of chassis.

FUSES

Two fuses are used. One for horizontal sweep circuit protection and one for low voltage power supply protection. A fuse wire is used for filament protection.

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube. Rotate the two rings around the neck of the tube until the picture is properly centered.

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of H711

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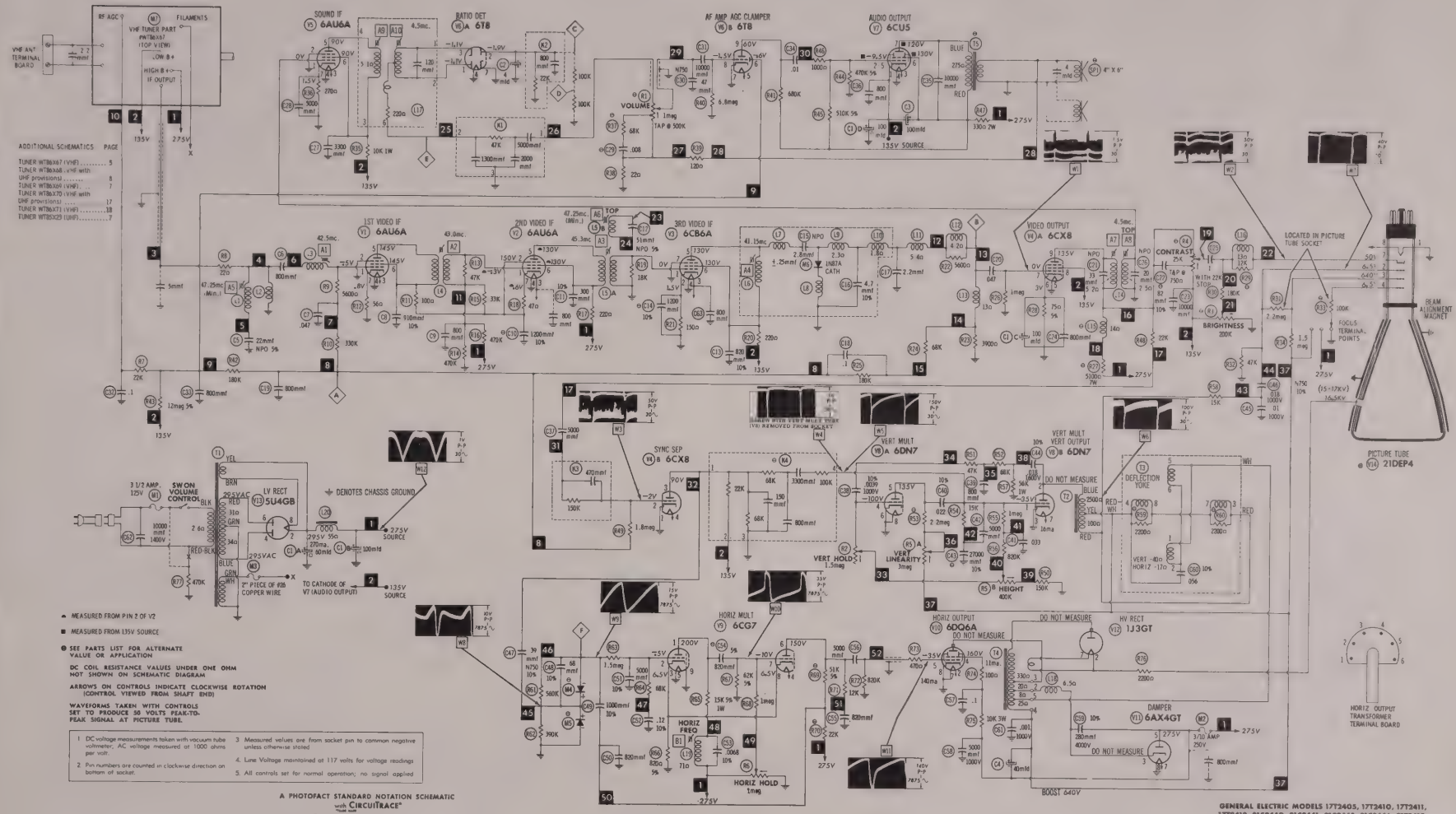
FOLDER 2 SET 416

GENERAL ELECTRIC MODELS 17T2405, 17T2410, 17T2411, 17T2412, 21C2440, 21C2441, 21C2445, 21C2446, 21T2419, 21T2420, 21T2421, 21T2425, 21T2426 & UHF (M4 Line)

GENERAL ELECTRIC MODELS 17T2405, 17T2410, 17T2411, 17T2412, 21C2440, 21C2441, 21C2445, 21C2446, 21T2419, 21T2420, 21T2421, 21T2425, 21T2426 & UHF (M4 Line)

SET 416 FOLDER 2



▲ MEASURED FROM PIN 2 OF V2

■ MEASURED FROM 135V SOURCE

● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

WAVEFORMS TAKEN WITH CONTROLS SET TO PRODUCE 30 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE.

1. DC voltage measurements taken with vacuum tube voltmeter, AC voltage measured at 1000 ohms per volt.
2. Pin numbers are counted in clockwise direction on bottom of socket.
3. Measured values are from socket pin to common negative unless otherwise stated
4. Line Voltage maintained at 117 volts for voltage readings
5. All controls set for normal operation; no signal applied

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE®

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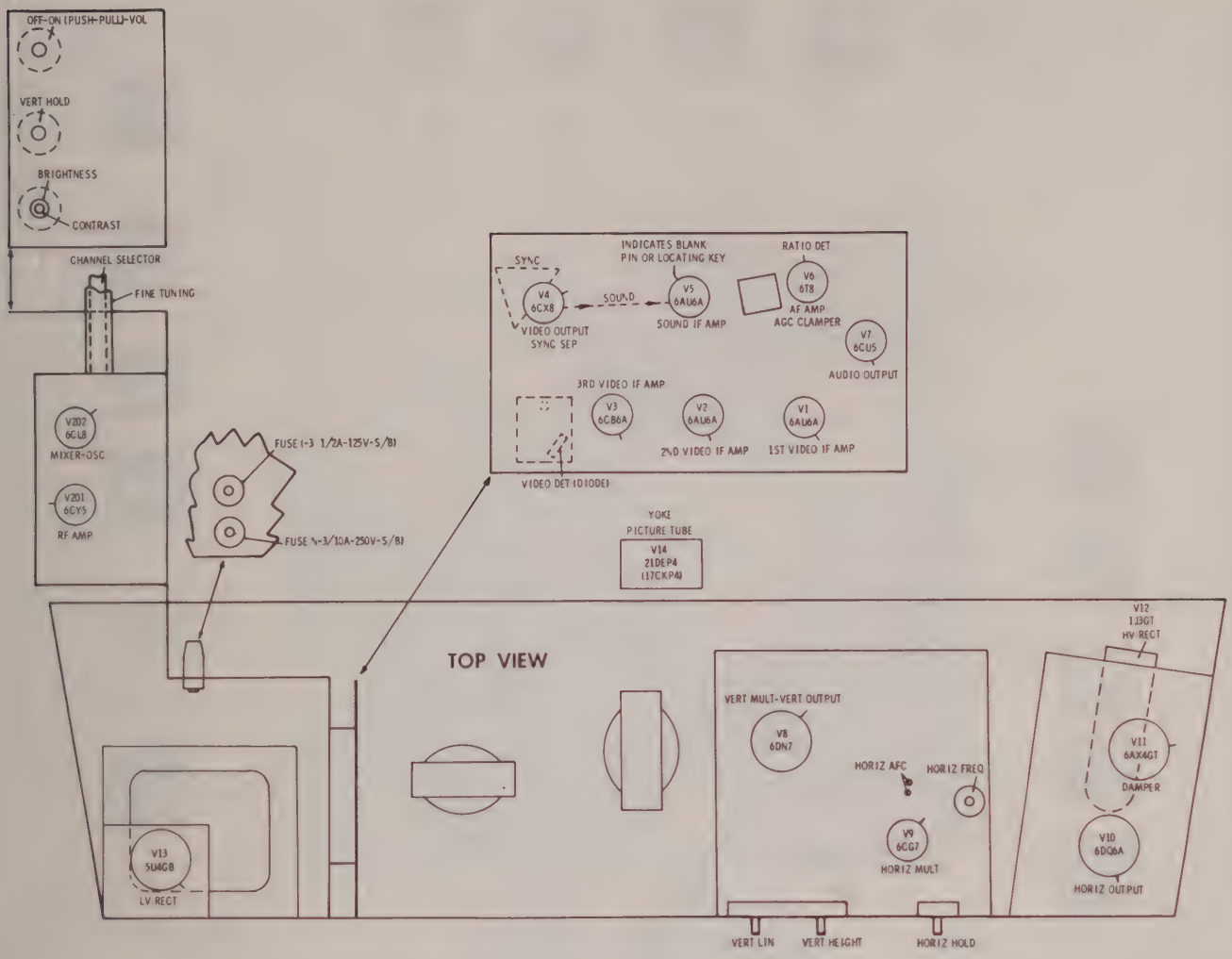
GENERAL ELECTRIC MODELS 17T2405, 17T2410, 17T2411, 17T2412, 21C2440, 21C2441, 21C2445, 21C2446, 21T2419, 21T2420, 21T2421, 21T2425, 21T2426 & UHF (M4 Line)

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

The following chart lists tubes whose failures are most likely to produce indicated symptoms. Refer to tube placement chart for location and type of tube.

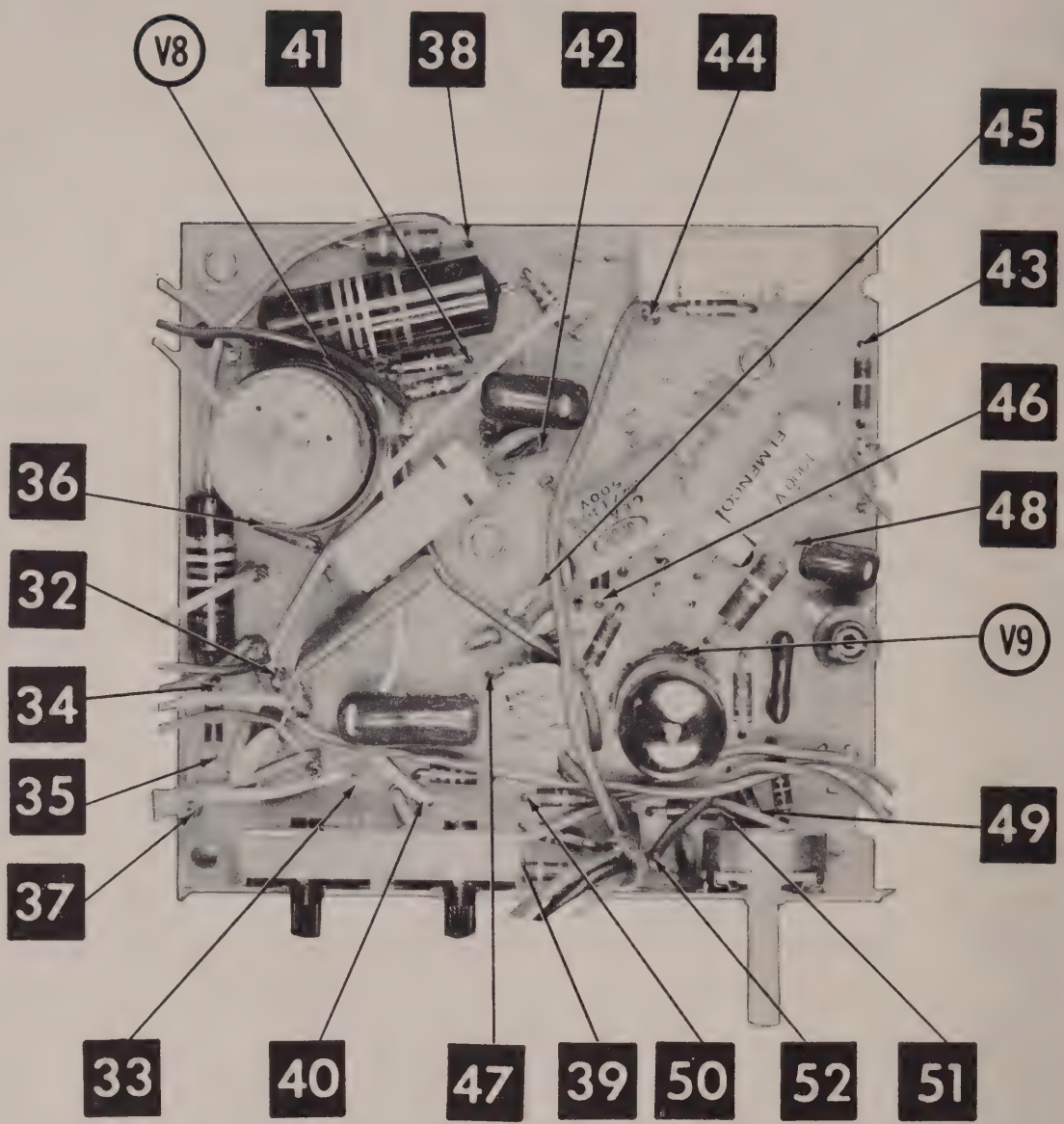
POWER SUPPLY FAILURE
No raster, no sound Fuse (M1, M3), V13

SWEEP FAILURE
No raster, has sound Fuse (M2), Rectifier (M4, M5), V9, V10, V11, V12, V14
No vertical deflection V8
Poor vert. linearity or foldover V8
Poor horiz. linearity or foldover V9, V10, V11
Narrow picture V9, V10, V11, V13
Vert. off freq. V8,
Horiz. off freq. V9

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster V1, V2, V3, Diode (M5), V4, V7
No pic, no sound, has snow V201, V202, V1, V7
No pic, has sound, has raster V4, V14
Has pic, no sound V5, V6, V7

SYNC FAILURE
No vert. sync V4
No horiz. sync V4, M4, M5
No vert. or horiz. sync V4

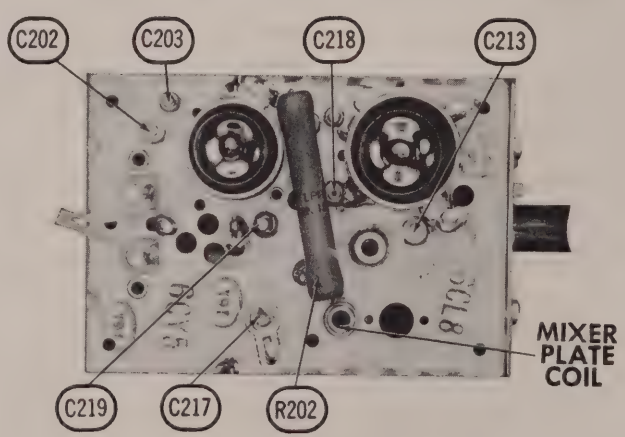
CircuiTrace Numbers 32 thru 52



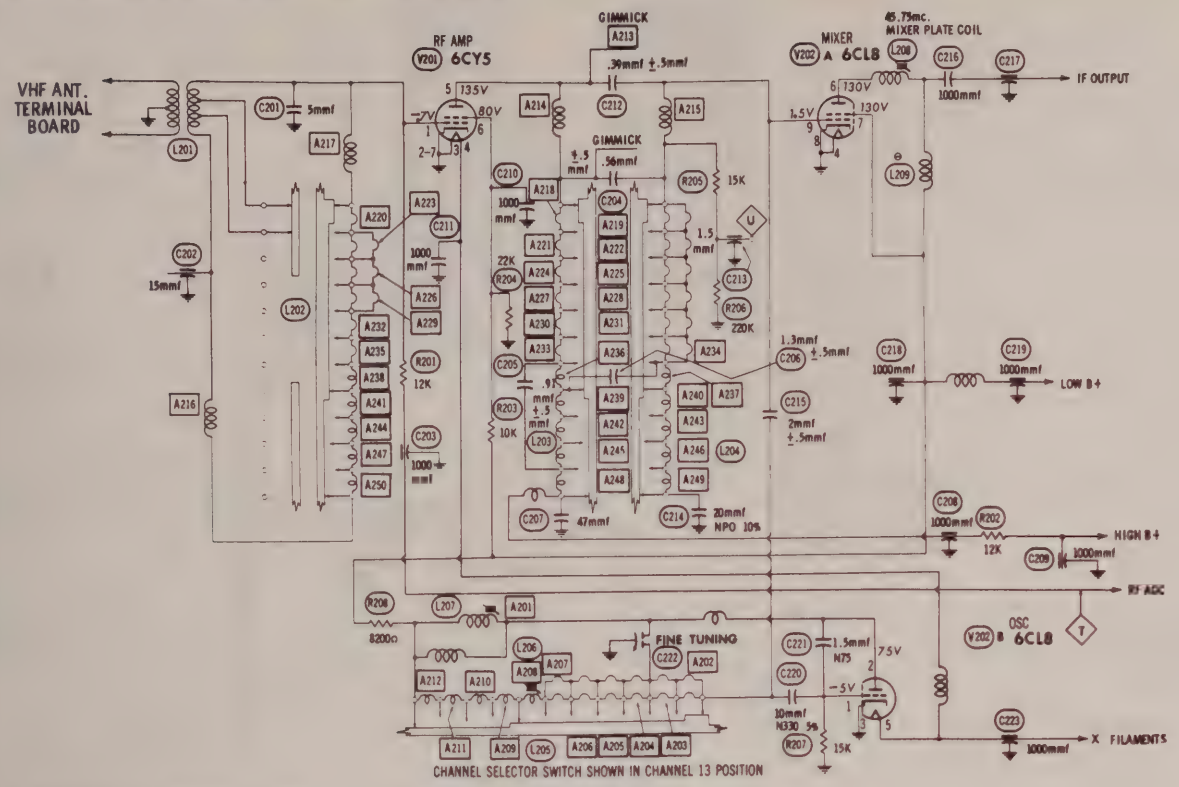
A Howard W. Sams CIRCUITRACE* Photo
*TRADE MARK

SWEEP PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



TUNER - TOP VIEW



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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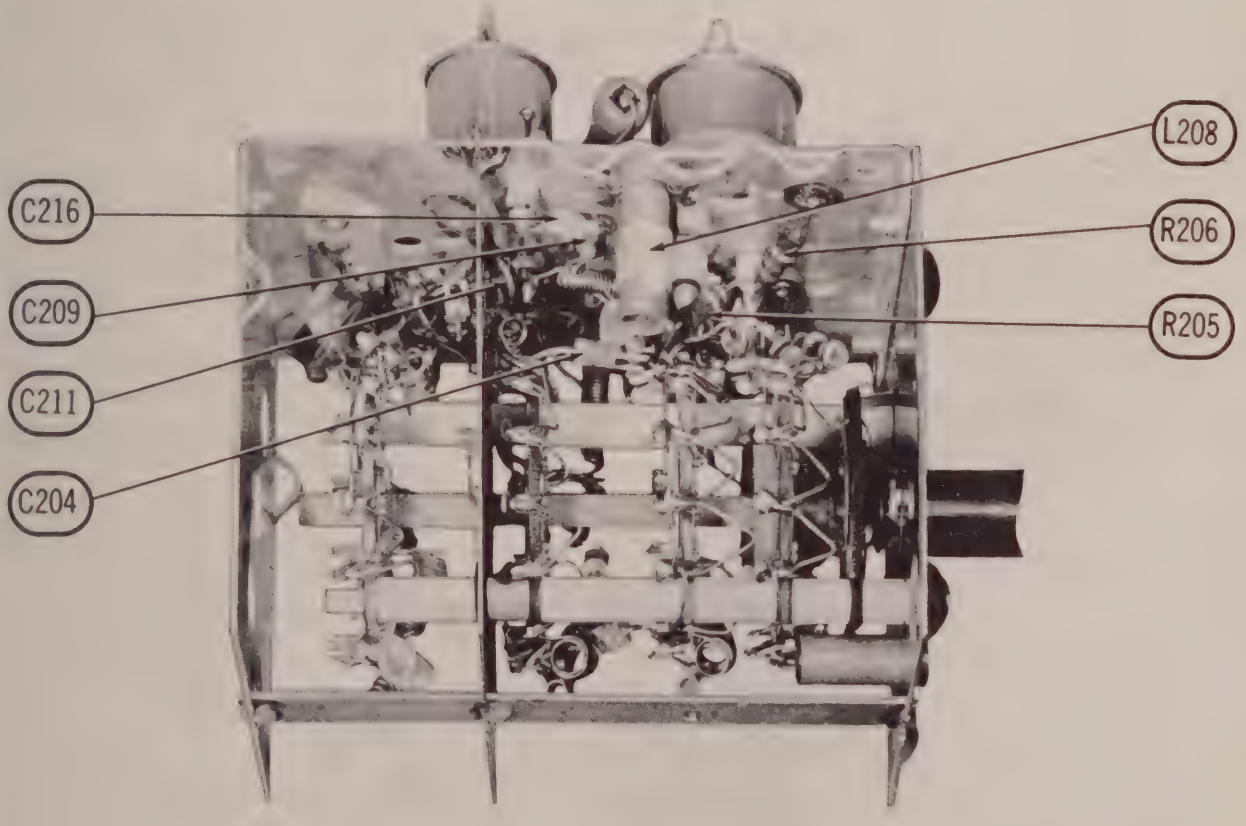
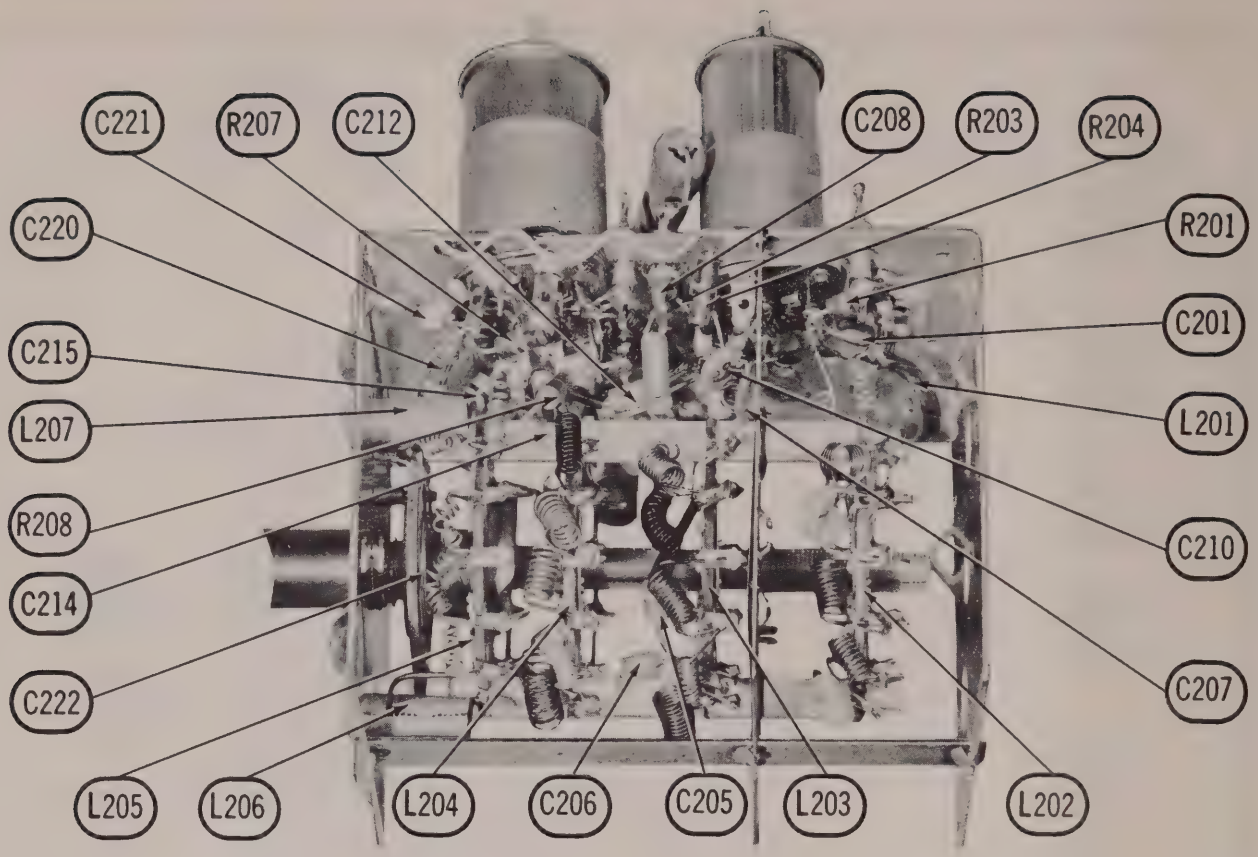
VHF TUNER #WT86X67



TUNER - LEFT SIDE



TUNER—RIGHT SIDE

TUNER WT86X67 – WT86X68

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

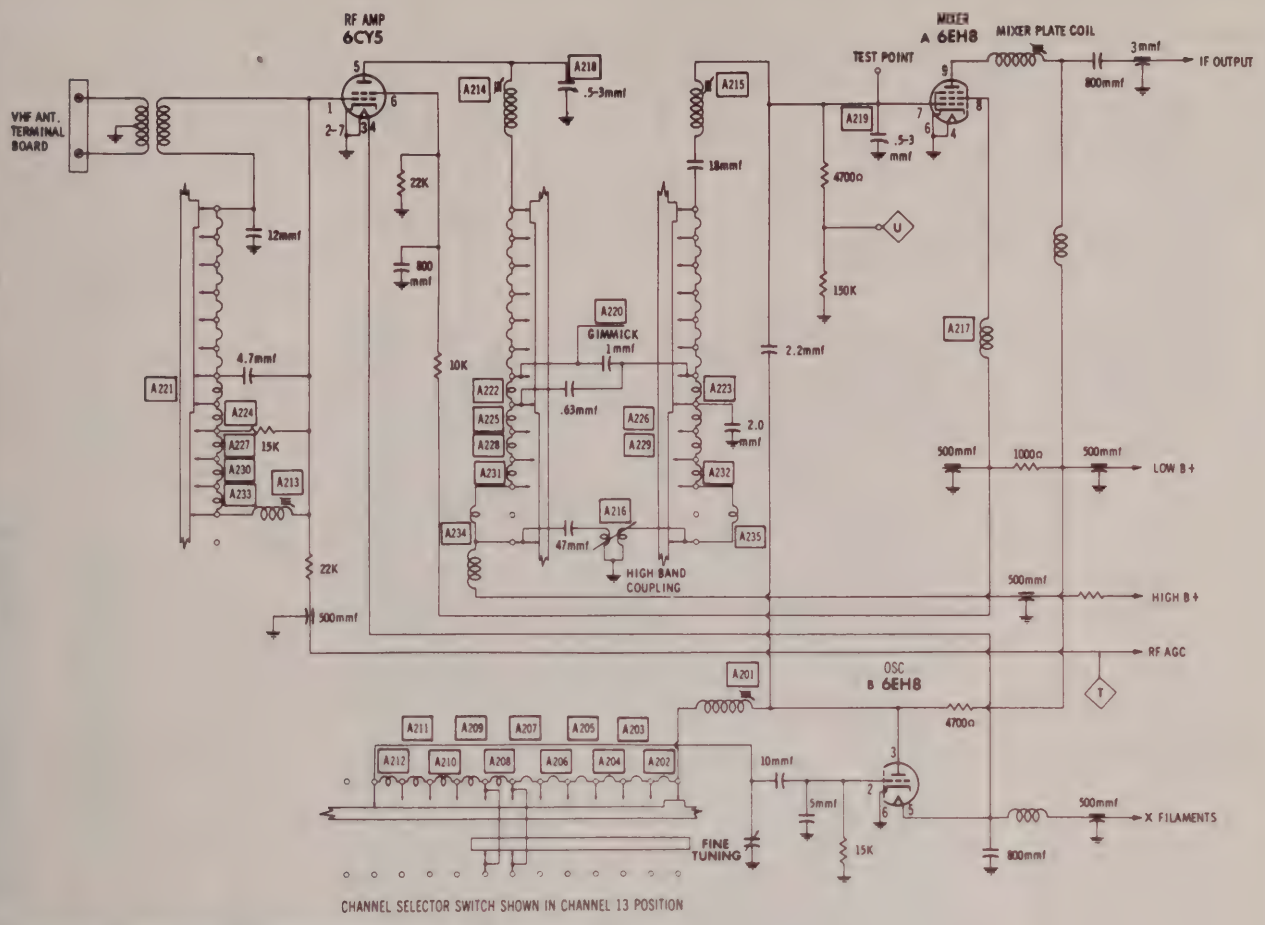
USE AN ISOLATION TRANSFORMER TO PROTECT THE TEST EQUIPMENT.
The High Voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up receiver for the receiver and test equipment.

VHF OSCILLATOR ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Set the Fine Tuning to the center of its range.
Use only enough sweep generator output to provide a usable pattern on scope.
Connect variable bias to IF AGC line. Adjust bias to obtain response curve which shows no indication of overloading.
Use 10MC sweep unless otherwise noted.
Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Fig. 201	Across antenna terminals thru matching network (Fig. 201).	213MC	211.25MC 215.75MC	13	Vert. Amp. thru 47K across video det. load.	A201	Adjust to place video marker at 50% as in Fig. 202.
			207MC	205.25MC 209.75MC	12		A202	
			201MC	199.25MC 203.75MC	11		A203	
			195MC	193.25MC 197.75MC	10		A204	
			189MC	187.25MC 191.75MC	9		A205	
			183MC	181.25MC 185.75MC	8		A206	
			177MC	175.25MC 179.75MC	7		A207	
			85MC	83.25MC 87.75MC	6		A208	
			79MC	77.25MC 81.75MC	5		A209	
			69MC	67.25MC 71.75MC	4		A210	
			63MC	61.25MC 65.75MC	3		A211	
			57MC	55.25MC 59.75MC	2		A212	

CONTINUED ON PAGE 19



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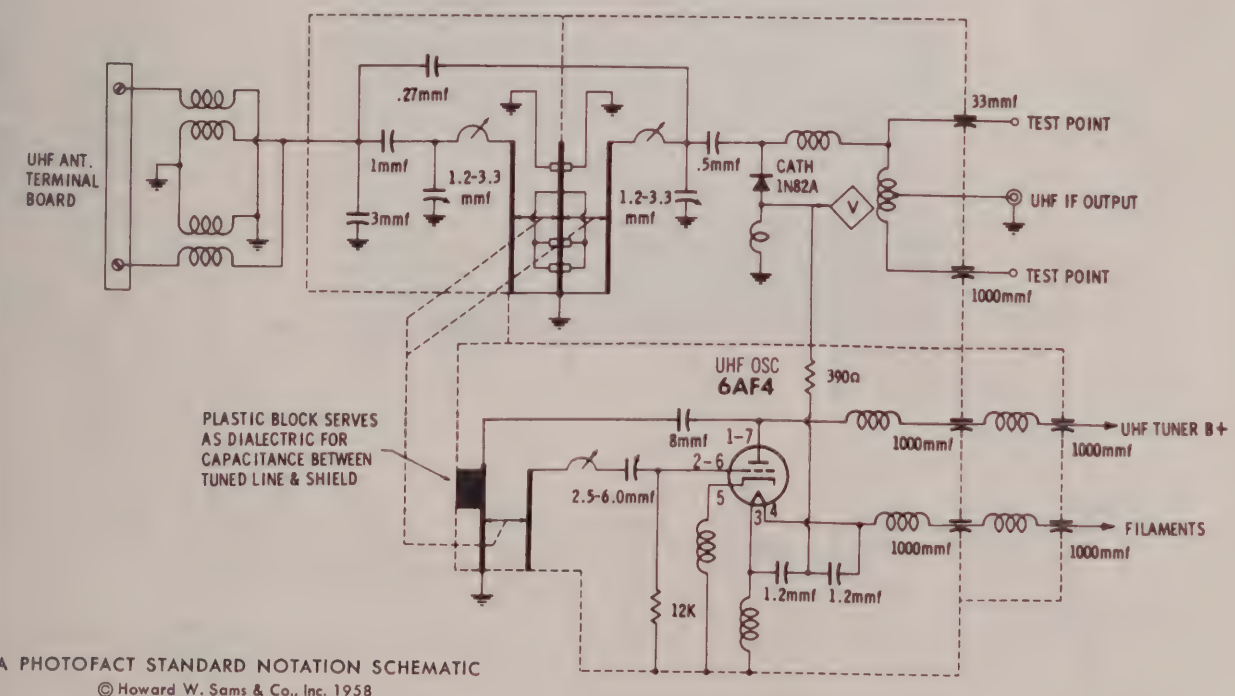
VHF TUNER #WT86X69



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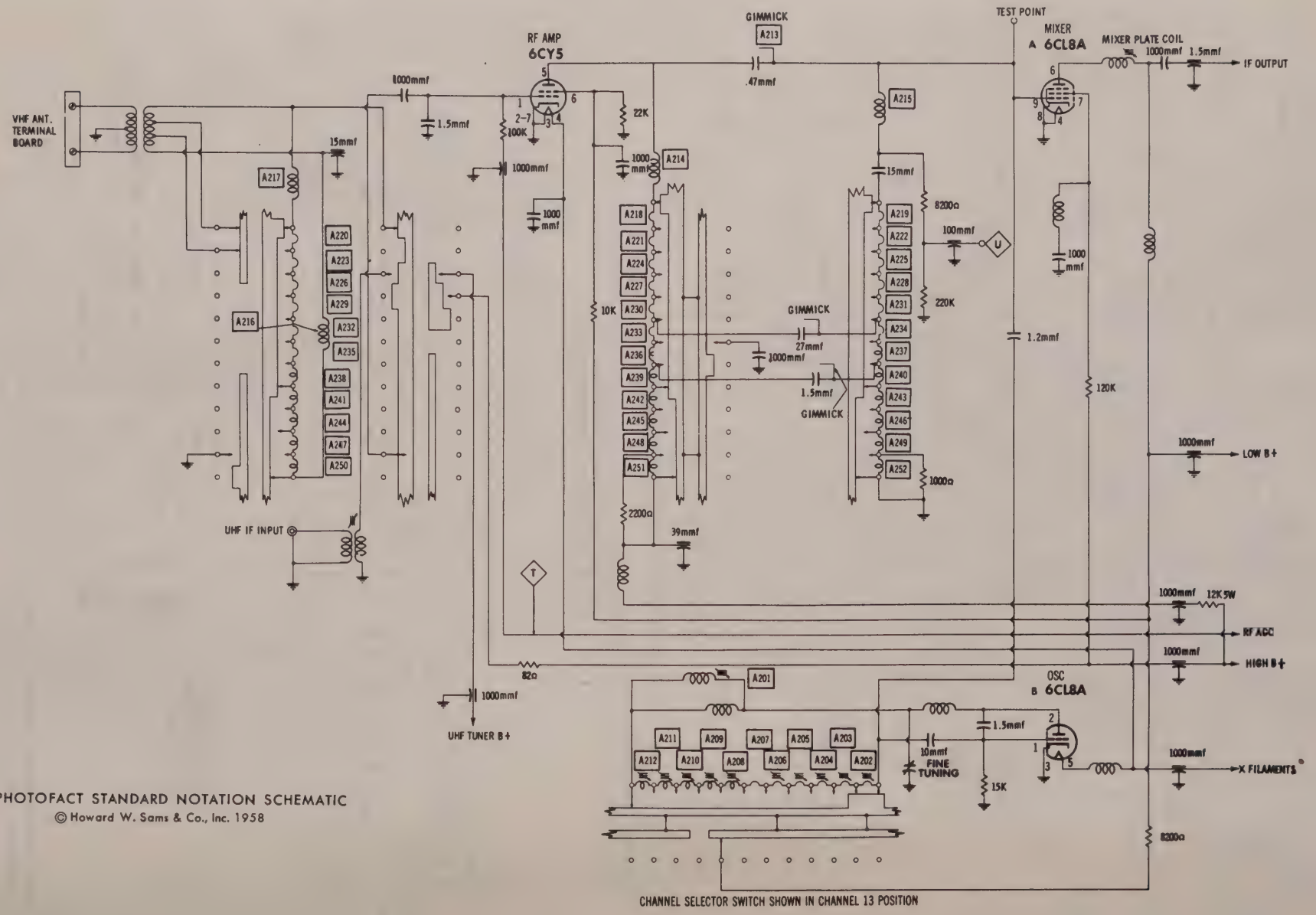
UHF TUNER #WT85X23



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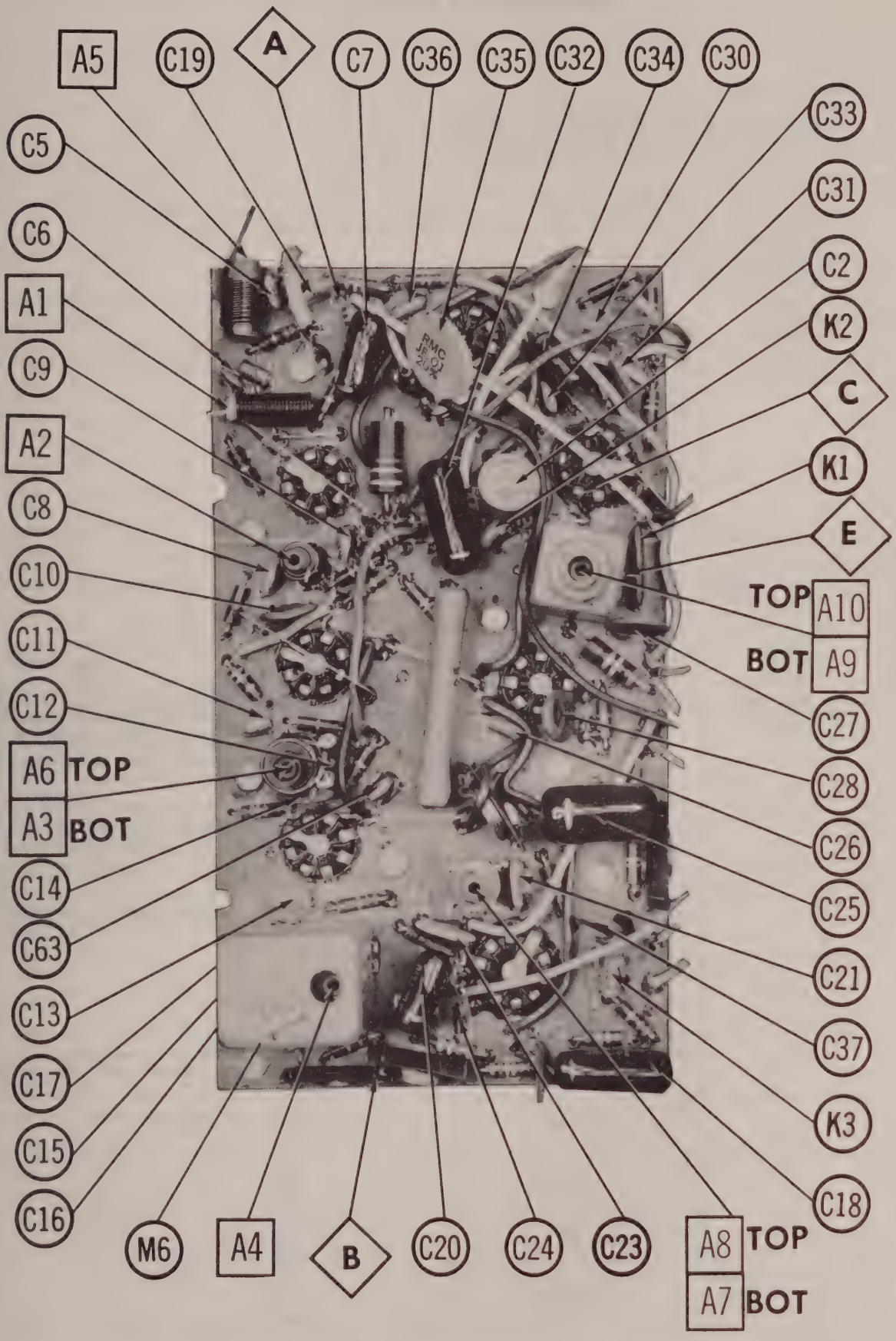
VHF TUNER W/UHF PROVISIONS #WT86X68



VIDEO IF PRINTED BOARD - CAPACITOR & ALIGN IDENT

GENERAL ELECTRIC MODELS 17T2403, 17T2410, 17T2411, 17T2412, 21C2440, 21C2441, 21C2445, 21C2446, 21T2419, 21T2420, 21T2421, 21T2425, 21T2426 & UHF (M4 Line)

TUNER WT86X69, WT86X70
ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

USE AN ISOLATION TRANSFORMER TO PROTECT THE TEST EQUIPMENT .
The High Voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.

VHF OSCILLATOR ALIGNMENT

Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Connect variable bias to IF AGC line. Adjust bias to obtain response curve which shows no indication of overloading.
Set the Fine Tuning to the center of its range.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.
Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Fig. 201	Across antenna terminals thru matching network (Fig. 201).	213MC	211.25MC	13	Vert. Amp. thru 47K across video det. load.	A201	Adjust to place sound marker in trap notch as in Fig. 202.
			207MC	205.25MC	12		A202	
			201MC	199.25MC	11		A203	
			195MC	193.25MC	10		A204	
			189MC	187.25MC	9		A205	
			183MC	181.25MC	8		A206	
			177MC	175.25MC	7		A207	
			85MC	83.25MC	6		A208	
			79MC	77.25MC	5		A209	
			69MC	67.25MC	4		A210	
			63MC	61.25MC	3		A211	
			57MC	55.25MC	2		A212	

VHF RF AND MIXER ALIGNMENT

Connect the negative lead of a 3 volt bias supply to point (T). Positive to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.
Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
2.	Fig. 201	Across VHF antenna terminals thru matching network (Fig. 201).	213MC	211.25MC 215.75MC	13	Vert. Amp. thru 10K to point (U). Low side to chassis.	A213, A214, A215, A216, A217	Adjust for maximum gain and symmetry similar to Fig. 203 with markers as shown. Adjust bandwidth by changing position of A216 with respect to capacitor. If dip is excessive, adjust A217 only SLIGHTLY to prevent loss of gain.
3.	"	"	177MC	175.25MC 179.75MC	7	"	A218, A219, A220	Adjust for maximum gain and symmetry of response similar to Fig. 203 with markers as shown . Adjust bandwidth by repositioning the "Gimmick" wire (A220) with respect to adjacent capacitor. Recheck step 2.
4.	"	"	207MC	205.25MC 209.75MC	12	"		Check for correct tilt on each channel. If necessary make compromise adjustments of A218 and A219 for best tilt on all channels.
			201MC	199.25MC 203.75MC	11			
			195MC	193.25MC 197.75MC	10			
			189MC	187.25MC 191.75MC	9			
			183MC	181.25MC 185.75MC	8			
5.	"	"	85MC	83.25MC 87.75MC	6	"	A221, A222, A223	Adjust for maximum gain and symmetry of response similar to Fig. 203 with markers as shown.
6.	"	"	79MC	77.25MC 81.75MC	5	"	A224, A225, A226	Check tracking. Adjust for proper response if necessary.
7.	"	"	69MC	67.25MC 71.75MC	4	"	A227, A228, A229	"
8.	"	"	63MC	61.25MC 65.75MC	3		A230, A231, A232	"
9.	"	"	57MC	55.25MC 59.75MC	2	"	A233, A234, A235	"

CONTINUED ON PAGE 15

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

The High Voltage lead should be securely taped and kept away from the chassis.
Allow a 20 minute warm-up period for the receiver and test equipment.

VIDEO IF ALIGNMENT

Set Volume Control fully counterclockwise and Contrast fully clockwise. Short the antenna terminals together with a short jumper wire.
Connect the negative lead of a 4 volt bias supply to point Ⓐ. Positive to chassis.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough sweep generator output to provide a usable pattern on scope.
The tuning core of A3 has a smaller hex opening than the other slugs. Use a smaller alignment tool. This allows A3 to be aligned without disturbing A6 as the tool is withdrawn.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	Fig. 1	Connect thru network (Fig. 1) to Tuner Test jack located on top of tuner.	Not used	45.75MC (Unmod)	Any non-interfering channel	USE VTVM DC probe thru 22K to point Ⓑ. Low side to chassis. (Across Video Det. Load)	Mixer Plate Coil	Adjust for maximum deflection.
2.	"	"	"	42.5MC	"	"	A1	"
3.	"	"	"	43.0MC	"	"	A2	"
4.	"	"	"	45.3MC	"	"	A3	"
5.	"	"	"	44.15MC	"	"	A4	"
6.	"	"	"	47.25MC	"	"	A5, A6	Adjust for MINIMUM deflection.
7.	"	"	44MC (10MC Swp)	41.25MC 42.5MC 44.15MC 45.0MC 47.25MC	"	"		Check for response similar to Fig. 2 with markers as shown. If necessary, retouch proper slug(s) to obtain desired response. High frequency side of curve is controlled by Mixer Plate Coil and A3. Low frequency side is controlled by A1 and A2. Adjust A4 to control peak and shape of curve. If necessary, retouch A5 and A6 to correctly position 47.25MC marker.

4.5MC TRAP ALIGNMENT

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
8.	.001mfd	High side to point Ⓑ. Low side to chassis.	Not used	4.5MC (400∿ 30% AM Mod)	Any non-interfering channel	Vert. Amp. thru detector probe to pin 7 (cathode) of picture tube. Low side to chassis.	A7	Adjust for MINIMUM 400∿ indication on scope.

SOUND IF ALIGNMENT

Connect two matched 100K (±1%) resistors in series from point Ⓒ to chassis. The junction of these two resistors is alignment point Ⓓ as shown on the schematic.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	CHANNEL	CONNECT VTVM	ADJUST	REMARKS
9.	.001mfd	High side to point Ⓑ. Low side to chassis.	4.5MC (Unmod)	Any non-interfering channel	DC probe to point Ⓒ. Common to chassis.	A8, A9	Adjust for maximum deflection.
10.	"	"	"	"	DC probe to point Ⓔ. Common to point Ⓓ.	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.

TUNER ALIGNMENT INSTRUCTIONS LOCATED ON PAGES 6, 10, 15 & 19

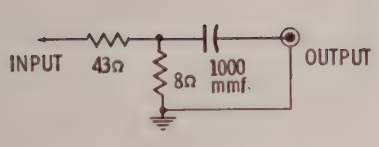


FIG. 1

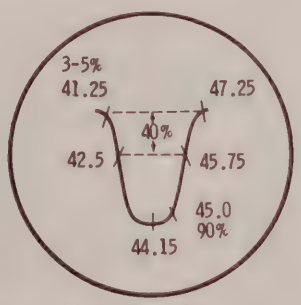


FIG. 2

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	1st Video IF Amp.	6AU8A	
V2	2nd Video IF Amp	6AU6A	
V3	3rd Video IF Amp	6CB6A	
V4	Video Output-Sync Sep.	6CX8	
V5	Sound IF Amp	6AU6A	
V6	Ratio Det - AF Amp. - AGC Clamper	6T8	

ITEM No	USE	TYPE	NOTES
V7	Audio Output	6CU5	
V8	Vert. Mult. - Vert. Output	6DN7	
V9	Horiz Mult	6CG7	
V10	Horiz. Output	6DQ6A	
V11	Damper	6AX4GT	
V12	HV Rectifier	1J3GT	
V13	LV Rectifier	5U4GB	

PICTURE TUBE

ITEM No	REPLACEMENT DATA				NOTES
	G E PART No	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No.	
V14	21DEP4 ① 17CKP4	21DEP4 ① 17CKP4 ①	17BZP4 ③	21DEP4 ① 17CKP4 ③	① "Aluminized" ② "Silverama" ④ ③ "Silver Screen 85"

ELECTROLYTIC CAPACITORS

ITEM No	RATING		REPLACEMENT DATA							
	CAP	VOLT	G.E. PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	⌀60	350	WT31X165	AFH4-97-95				Q-187.5 -MT-15100	R2716 *
B	⌀100	350							
C	100	10							
D	⌀100	150							
C2	4	50	WT31X153	PRS250V4	BBR4-50	TT50X5	TD-4-50	MT-0504	TVA-1402
C3	100	150	WT31X129	AFH1-21	XA0241	FP116	TMS-22	S-090	TVA-1423
C4	40	400	WT31X164	PRS450V40	BR4045	TC78	TD-40-450	MT-4540	TVA-1712

* Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	G.E. PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C5	22		WT18X366	NPO-DI 33	DTZ-23	C10Q33C		5TCC-Q22	NPO 5%
C6	800		WT18X84	BPD-0008	DD-801	L10T8		5GA-T8	
C7	.047	200	WT25X23	P288N-047	DF-503	CUB2B47	GEM-4147	2TM-847	
C8	910		WT18X378						10%
C9	800		WT18X380	BPD-0008	DD-801	L10T8		5GA-T8	
C10	1200		WT18X200						10% ①
C11	300		WT18X367		MD-301	L10T3			10%
C12	51		WT18X264						NPO 5%
C13	820		WT18X370						10%
C14	1200		WT18X200						10% ①
C15	2.8		WT18X373						NPO ± .25mmf
C16	4.7		WT21X36	NPO-SI 4.7	TCZ-4R7	CTA5V47C	ZT-5547	5TCCB-V47	10%
C17	2.2		WT21X23	NPO-SI 2.2	TCZ-2R2	CTA5V22C		5TCCB-V22	
C18	.1	200	WT25X24	P288N-1	DF-104	CUB4P1	GEM-401	2TM-P1	
C19	800	300	WT18X368	BPD-0008	DD-801			5GA-T8	
C20	.047	200	WT25X23	P288N-047	DF-503	CUB2B47	GEM-4147	2TM-847	
C21	33		WT18X386	NPO-DI 33	DTZ-33	C10Q33U	ZT-5433	5TCC-Q33	NPO
C22	82		WT21X37	NPO-SI 82	D6-820	CTA6Q82C			10% ②
C23	10000		WT18X289	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C24	800		WT18X84	BPD-0008	DD-801	L10T8		5GA-T8	
C25	.1	400	WT25X24	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C26	20		WT18X187	NPO-SI 20	DTZ-20	C10Q2C	ZT-542	5TCC-Q2	NPO
C27	3300		WT18X371	BPD-0033	DD-332	BYA10D33	UC-5333	5HK-D33	
C28	5000		WT18X86	BPD-005	DD-502	BYA10D6	DC525	5HK-D6	
C29	.008	200		P288N-008			GEM-826	5TM-D8	②
C30	47		WT18X253	N750-DI 47	DTN-47	C10Q47U	NT-5447	5TCU-Q47	N750
C31	10000		WT18X299	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C32	.1	400	WT25X24	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C33	800		WT18X360	BPD-0008	DD-801	L10T8		5GA-T8	
C34	.01	400	WT25Y33	P488N-01	DE-103	CUB4Q	GEM-411	4TM-S1	
C35	10000		WT18X381	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C36	800		WT18X368	BPD-0008	DD-801	L10T8		5GA-T8	
C37	5000		WT18X86	BPD-005	DD-502	BYA10D6	DC525	5HK-D6	
C38	.00039	1000	WT26X16						10%
C39	800		WT18X369	BPD-0008	DD-801	L10T8		5GA-T8	
C40	.022	600	WT26X36						10%
C41	.033	200	WT25X25	P288N-033		CUB6B33	GEM-4133	5TM-S33	
C42	5000		WT18X86	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C43	27000		WT16X372						10% ①
C44	.018	1600	WT26X46						10%
C45	.01	1000		P1088N-01		CUB10S1	GEM-1011	10TM-S1	
C46	.018	1000	WT26X42						10%
C47	39		WT18X285			C10Q39U			N750 10%
C48	68		WT18X325	N750-DI 68	DTN-68	C10Q68U		5TCU-Q68	N750 10%
C49	1000		WT18X215						10%
C50	820		WT18X250		DD-821	L10T82		5GA-T82	
C51	5000		WT18X260						10%
C52	.12	200	WT25X34						10%
C53	.0068	400	WT25X29				GEM-16268		10%
C54	820		WT19X54	1484-00082		1R5T82		MB-383	5% ③
C55	820		WT18X260		DD-821	L10T82		5GA-T82	
C56	5000		WT18X86	BPD-005	DD-502	BYA10D6	DC525	5HK-D6	
C57	.1	400	WT25X24	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C58	5000	1000	WT18X375	DAC-9	DD-502	BYA10D5		5HK-D5	
C59	280	4000	WT18X374						10%
C60	.056	600	WT26X22						10%
C61	.001	1000	WT25X32	P1088N-001		CUB10D1	GEM-1021	10TM-D1	
C62	10000	1400	WT18X280	DAC-27	DDI6-103	HVE16S1		20HKB-S1	
C63	800		WT18X84	BPD-0008	DD-801	L10T8		5GA-T8	

① Some versions may use 800mmf in this application (Part #WT18X84).
② Not used in 17" Models.
③ Special temperature compensating.
④ Some versions may use 680mmf 5% in this application (Part #WT20X128).

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	G. E. PART No	CENTRALAB PART No	CLAROSTAT PART No	IRC PART No	MALLORY PART No	
R1	1meg	½	WT49X372		RTV-673		PP16T55	Volume, Push-Pull Sw., Tap ② 500K ①
R3A	1.5meg	½	WT49X271	AB-742	A47-1.5meg -8	QU-138	U155	Vert. Hold
B	Shaft			AK-2	RS-3/16	NQ	D8-37	
R2	200K	½	WT49X276					Brightness ③
R4	25K	½	WT49X281					Contrast, Tap ④ 8750Ω with 22K stop ③
R5A	3meg	½	WT49X274		B47-3meg-8	BU-140 *	PTA355L	Vert. Lin.
B	400K				B47-500K-8	BU-133 *	PTA55R	Height
R6	1meg	½	WT49X273		B47-1meg-8	BU-137 *	PTA1254L	Horiz. Hold

* Use IRC TM3 Kit for shaft assembly.
① A 1meg tap ② 500K volume control with push-type switch used in 17" models (Part #WT49X375).
② A 200K brightness control is used in 17" models (Part #WT49X270).
③ A 17K with stop ④ 15K is used in 17" models (Part #WT49X269).

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		G.E. PART No.	NOTES
	OHMS	WATT		
R7	22K			
R8	22Ω			
R9	5600Ω			
R10	330K			
R11	100Ω			
R12	56Ω			
R13	47K			
R14	470K			
R15	33K			
R16	470K			
R17	220Ω			Note 5
R18	47Ω			
R19	18K			
R20	220Ω			
R21	150Ω			
R22	5600Ω			
R23	3900Ω			Note 6
R24	68K			Note 6
R25	180K			
R26	1meg			
R27	5100Ω	7	WT14X119	Note 1
R28	75Ω 5%			
R29	12K			Note 2
R30	180K			
R31	2.2meg			
R32	47K			
R33	100K			Note 3
R34	1.5meg			
R35	10K	1		
R36	270Ω			Note 4
R37	68K			
R38	22Ω			
R39	120Ω			
R40	8.8meg			
R41	680K			
R42	180K			

ITEM No.	RATING		G.E. PART No.	NOTES
	OHMS	WATT		
R43	12meg 5%			
R44	470K 5%			
R45	510K 5%			
R46	1000Ω			
R47	330Ω	2		
R48	22K			
R49	1.8meg			
R50	150K			
R51	47K			
R52	68K			
R53	2.2meg			Note 5
R54	15K			
R55	1meg			
R56	820K			
R57	56K	1		
R58	15K			
R59	2200Ω			Note 6
R60	2200Ω			Note 6
R61	560K			
R62	390K			
R63	1.5meg			
R64	68K			
R65	15K 5%	1		
R66	8200Ω 5%			
R67	62K 5%			
R68	1meg			
R69	51K 5%			Note 7
R70	22K			Note 8
R71	12K			
R72	820K			
R73	470Ω			
R74	100Ω			
R75	10K	3	WT14X126	
R76	2200Ω			
R77	470K			

Note 1. 17" Models use 5600Ω 7W in this application (Part #WT14X116).
Note 2. 17" Models use 22K in this application
Note 3. Late production omitted R33 and grounded pin 4 of V14.
Note 4. Not used in 17" Models.
Note 5. Some versions may use 1.8meg in this application.
Note 6. Some versions may use 1000Ω in this application.
Note 7. Some versions may use 43K 5% in this application.
Note 8. Some versions may use 33K in this application.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		G.E. PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	47.25MC Trap	WT36X379					
L2	RF Choke	WT36X377					
L3	1st. Video IF	WT36X378					
L4	2nd. Video IF	WT61X92					
L4A	3rd. Video IF	WT61X93					
B	47.25MC Trap						
L6	4th. Video IF	WT36X382					
L7	RF Choke						1 Microhenry
L8	RF Choke						.22 Microhenry
L9	RF Choke						31 Microhenries
L10	RF Choke	WT36X96	19-1002	BC-563	4606-E		2.2 Microhenries ①
L11	RF Choke	WT36X344					7.5 Microhenries ①
L12	Series Peaking Coil	WT36X373					68 Microhenries
L13	Shunt Peaking Coil	WT36X345		TV-204			560 Microhenries
L14A	4.5MC Trap	WT36X383					
B	1st. Sound IF						
L15	Shunt Peaking Coil	WT36X261	19-3660	TV-206	6148		680 Microhenries ②
L16	Series Peaking Coil	WT36X374	19-3300	TV-199	6156		300 Microhenries
L17	Ratio Detector	WT56X46					
L18	RF Choke	WT36X105	19-1005	BC-566	4612		10 Microhenries ③

① IRC Part #CLA. ② 17" Models use 820 Microhenries (Part #WT36X284). ③ IRC Part #CL-1.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA						NOTES
	PRI.	SEC.	G.E. PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	Thordarson PART No.	
L19	7Ω		WT36X349						

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA						
	CURRENT (Measured)	DC RES.	INDUCTANCE @ CURRENT 1000 ~(∿)	G.E. PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L20	.270A	65Ω	1.2 Hy.	#T63X56	C5037 ①	C-2996 ①	F-803 ①	C-2328 ①	26C44 ①	C-17X ①

① Drill new mounting hole.

TRANSFORMER (POWER)

ITEM No	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	G.E. PART No	Halldorson PART No	Merit PART No	Ram PART No	Stancor PART No	Thordarson PART No	Triad PART No
T1	117V @ 1.74A	580VCT @ 270A	5V @ 2.4A	WT88X36						
	SEC. 3	SEC. 4	SEC. 5							
	6.3V @ 8.5A									

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No.	USE	REPLACEMENT DATA							
		G.E PART No	Halldorson PART No	Merit PART No	Ram PART No	Rogers PART No	Stancor PART No	Thordarson PART No	Triad PART No.
T2	Vert. Output	WT84X69	21B07	A-3037	V315		V0-101		A-119X ①
T3A	Yoke-Horiz. (12MH)	WT76X27						Y-5I ②	
B	(110°)-Vert. (40MH)								
	Centering Device	WT42X68							
	Yoke Clamp	WT5X33							
T4	Horiz. Output	WT77X41							

① Drill new mounting hole(s).
② Connect C90 across yoke terminals #6 and #3, yoke terminal #3 to terminal #4 of T4, yoke terminal #5 to terminal #6 of T4, and yoke terminal #4 to junction of R58 & red lead of T3.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	G.E. PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No	Triad PART No	
T5	8400Ω	3-4Ω	WT64X70 ①	21103 ②	A-3035 ②	AU-803 ②	A-3332 ②	26S59 ②	S-1X ②	

① 17" Models use Part #WT64X71.
② Drill new mounting hole.

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP	G. E. PART No.	QUAM PART No.	
SP1	4" x 6"	PM	3-4Ω	WT95X22 ①	46A07	① Used in Models 21T3425, 21T3426
	8"	PM	3-4Ω	WT95X7 ②		② Used in Models 21C3440, 21C3441, 21C3445, 21C3446
	4"	PM	3-4Ω	WT95X23 ③		③ Used in Models 21C3445, 21C3446
	4"	PM	3-4Ω	WT95X6 ④		④ Used in Models 21T2419, 21T2420, 21T2421
	4"	PM	3-4Ω	WT96X21 ⑤		⑤ Used in all 17" Models.

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	G.E. PART No	REPLACEMENT DATA	
K1	De-emphasis Network	1300mmf, 2000mmf, 5000mmf	WT33X20		
K2	Ratio Detector Network	800mmf, 22K	WT24X5	Centralab	RC-478
				Sprague	PRC-4
K3	Sync Sep. Coupling	470mmf, 150K	WT24X7		
K4	Vert. Integrator	150mmf, 800mmf, 3300mmf, 22K, 68K, 68K, 100K	WT33X21 ①		

① Late production uses 100mmf, 800mmf, 3300mmf, 22K, 68K, 68K, 100K (Part #WT33X23).

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			G.E. PART No		LITTELFUSE PART No.		BUSS PART No	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1	N	3½A 125V 8/B	WT10X26	WT8X51	33303.5 (N 3½A-125V-8/B)	348018	N 3½	HN 3½ to 3½
M2	N	3/10A 250V 8/B	WT10X25	WT8X63	332.300 (N 3/10A-125V-8/B)	348008	N 3/10	HN 0 to 3/10
M3	#26 Copper Wire 2" Length							

CRYSTAL DIODES

ITEM No.	ORIG TYPE	REPLACEMENT DATA			NOTES
		G.E. PART No.	CBS PART No.	SYLVANIA PART No.	
M4		WT16X4 ①	1N34A	1N34A	Horiz. AFC (Pigtail)
M5		WT16X4 ①	1N34A	1N34A	Horiz. AFC (Pigtail)
M6	1N87A	WT16X1	1N64	1N295	Video Detector (Pigtail)

① Some versions may use a dual selenium diode (Part #WT16X7).

MISCELLANEOUS

ITEM No.	PART NAME	G.E. PART No.	NOTES
M7	Tuner	WT86X67	VHF
	Tuner	WT86X69	VHF
	Tuner	WT86X71	VHF
	Tuner	WT86X68	VHF with UHF provisions
	Tuner	WT86X70	VHF with UHF provisions
	Tuner	WT85X33	UHF
	Magnet	WT42X31	Beam Alignment
	Printed Board	WT93X22	Video Detector
	Printed Board	205793	Video IF, Sound
	Printed Board	211036	Sweep

GENERAL ELECTRIC MODELS 17T2405, 17T2410, 17T2411, 17T2412, 21C2440, 21C2441, 21C2445, 21C2446, 21T2419, 21T2420, 21T2421, 21T2425, 21T2426 & UHF (M4 Line)

FOLDER 2

PARTS LIST AND DESCRIPTIONS (Continued)

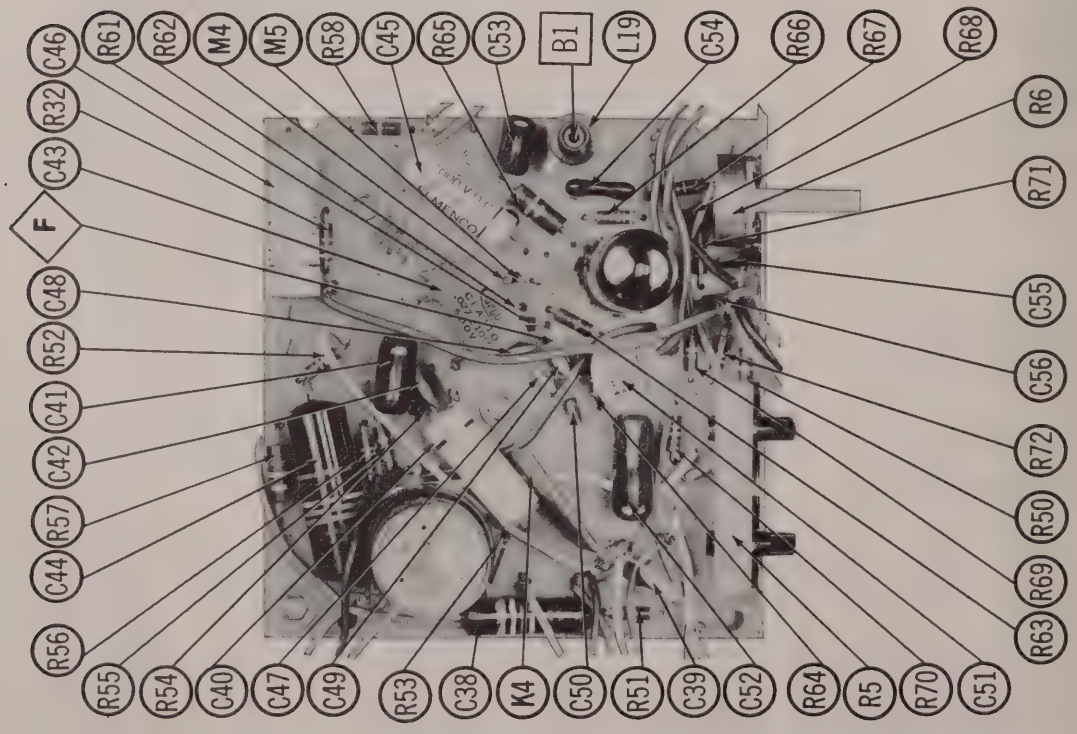
CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Safety Glass	WT94X74	Models 21T2425, 21T2426
Safety Glass	WT94X76	Models 17T2405, 17T2410, 17T2411, 17T2412
Safety Glass	WT94X77	Models 21T2419, 21T2420, 21T2421, 21C2440, 21C2441, 21C2445, 21C2446
Window	WT89X103	Channel, 17" Models
Window	WT94X75	Escutcheon, With Channel Numberals, Models 21T2425, 21T2426
Mask	WT96X45	Includes top and bottom push clips, Models 21T2419, 21C2440, 21C2441
Mask	WT96X46	Includes top and bottom push clips, Models 21T2420, 21T2421, 21C2445, 21C2446
Knob	WT43X269	Channel Selector, 21" Models
Knob	WT43X278	Channel Selector, 17" Models
Knob	WT43X256	VHF Fine Tuning, 21" Models
Knob	WT43X279	VHF Fine Tuning, 17" Models
Knob	WT43X273	VHF Fine Tuning, Black
Knob	WT43X280	UHF Indicator, 17" Models
Knob	WT43X272	UHF Dial, 21" Models
Knob	WT43X226	Brightness
Knob	WT43X270	Contrast, All Models except 17T2405
Knob	WT43X281	Contrast, Model 17T2405
Knob	WT43X271	On-Off-Volume, Vert. Hold, All Models except 17T2405
Knob	WT43X282	On-Off-Volume, Vert. Hold, Model 17T2405
Handle	WT78X61	Models 21T2425, 21T2426
Leg	WT78X64	Includes ferrule, Model 21C2440
Leg	WT78X65	Includes ferrule, Model 21C2441
Cabinet	WT99X40	Front, Models 21T2425, 21T2426
Cabinet	WT101X113	Rear, Models 21T2425, 21T2426
Cabinet	WT103X164	Model 17T2405
Cabinet	WT103X154	Model 17T2410
Cabinet	WT103X155	Model 17T2411
Cabinet	WT103X163	Model 17T2412
Cabinet	WT103X156	Model 21C2440
Cabinet	WT103X157	Model 21C4441
Cabinet	WT103X158	Model 21C2445
Cabinet	WT103X159	Model 21C2446
Cabinet	WT103X160	Model 21T2419
Cabinet	WT103X161	Model 21T2420
Cabinet	WT103X162	Model 21T2421
Cabinet	WT103X150	Model 21T2425
Cabinet	WT103X151	Model 21T2426

WIRING DATA

High Voltage Lead	Use BELDEN No.	8869
Shielded Hook-up Wire	Use BELDEN No.	8885 (Single Conductor) 8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No.	8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord (Interlock Type)	Use BELDEN No.	8874
300Ω Tuner Input Lead	Use BELDEN No.	8225
300Ω Antenna Lead-in	Use BELDEN No.	8230 or 8275
Antenna Rotor Cable	Use BELDEN No.	8464 (Flat) or 8484 (Round) - 4 Conductor 8485 (Round) - 5 Conductor 8488 (Round) - 8 Conductor



SWEEP PRINTED BOARD

TUNER WT86X69, WT86X70
ALIGNMENT INSTRUCTIONS CON'T

UHF IF ALIGNMENT FOR TUNER #RJX-100

Connect the negative lead of a 3 volt bias supply to point (T).
Disconnect the IF link from the grid coil of the 1st. Video IF stage and terminate the open end of the cable or link with a 68Ω resistor.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough sweep generator output to provide a usable pattern on scope.
Set the VHF tuner to the UHF position and adjust the UHF tuning for MINIMUM tilt of the response curve over the center of the tuning area (approximately 620MC).
Remove Germanium Diode from UHF Tuner.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
10.	Fig. 204	High side to point (V). Low side to chassis.	43.0MC (10MC Swp)	40.5MC 45.75MC	UHF	Vert. Amp. thru 10K to point (U). Low side to chassis.	A236, A237, A238, A239	Adjust A236 for maximum amplitude at 40.5 MC, A237 for maximum at 45.75MC and A238 for maximum gain and MINIMUM tilt (See Fig. 205).

UHF TUNER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

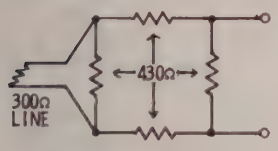
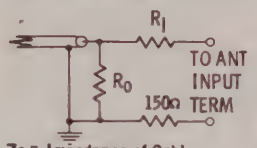


FIG 201



Z_0	R_0	R_1
50Ω	56Ω	120Ω
72Ω	82Ω	110Ω
92Ω	110Ω	100Ω

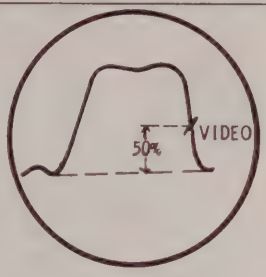


FIG. 202

FIG. 203

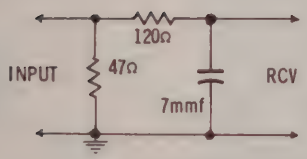


FIG. 204

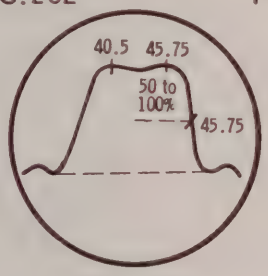
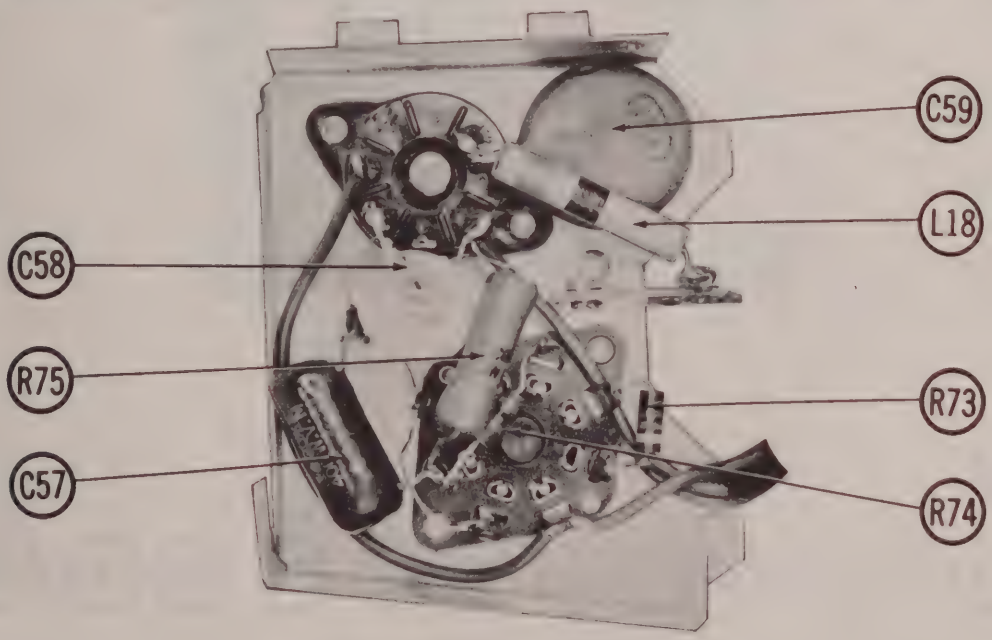


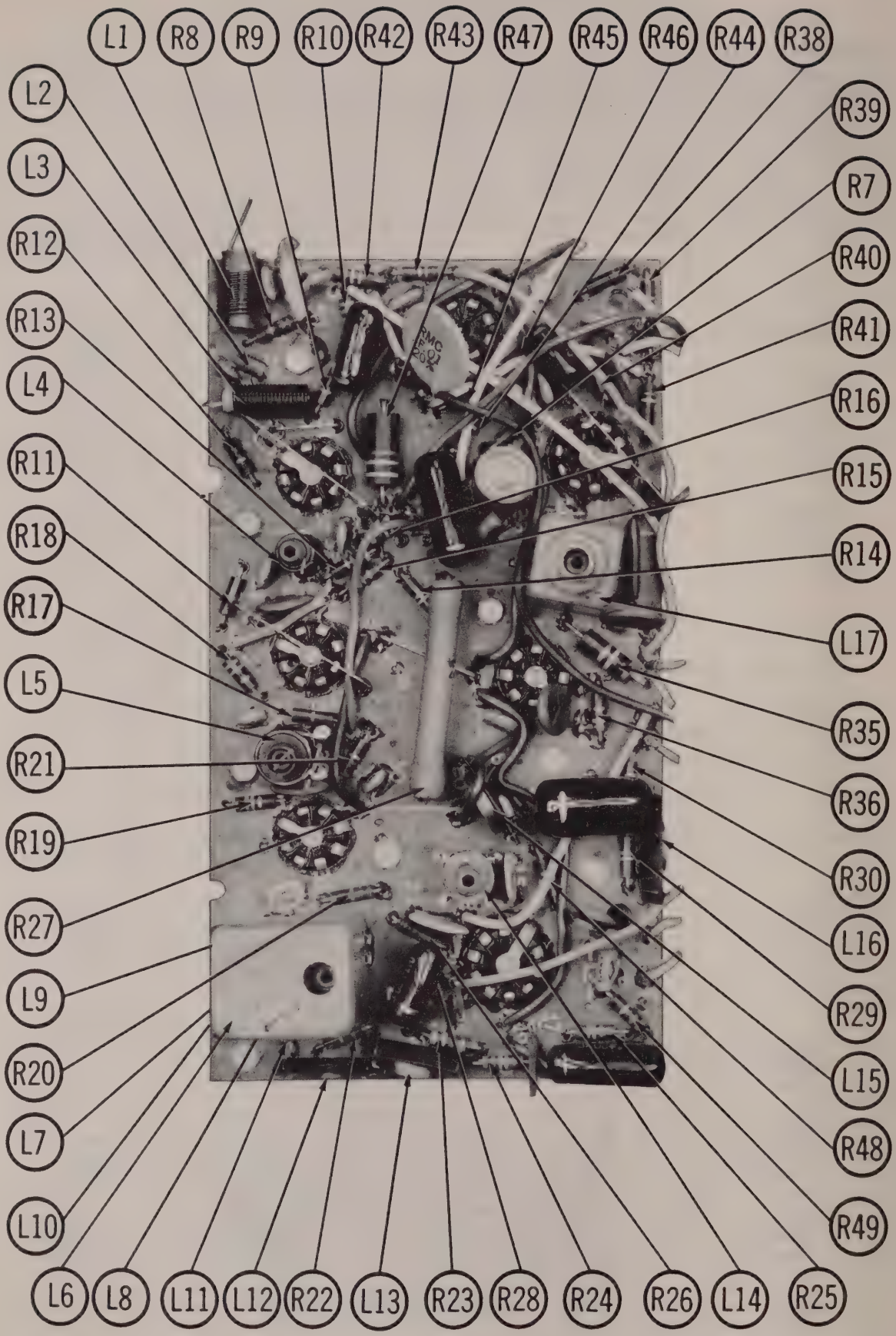
FIG. 205



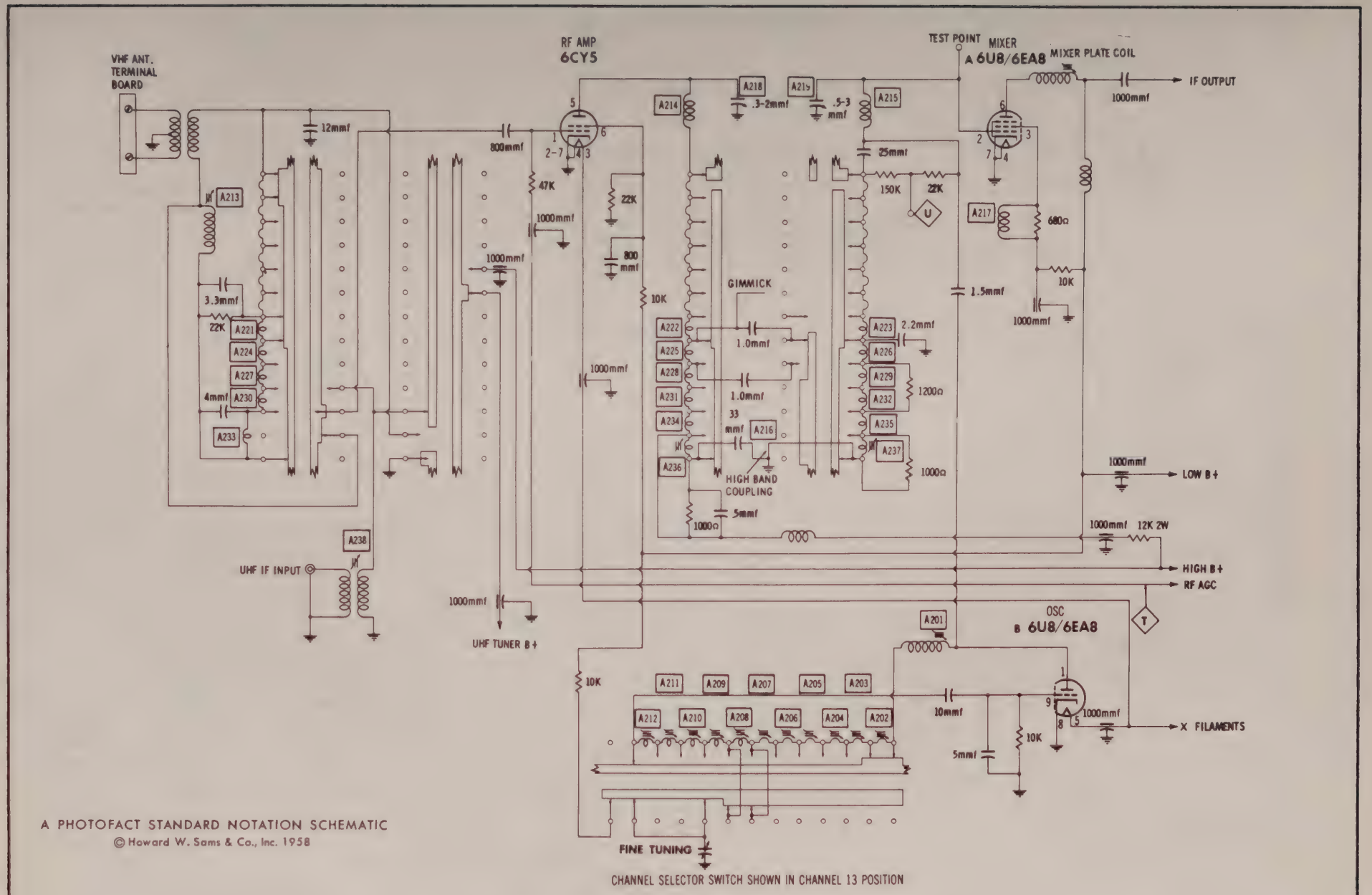
HORIZ SUB CHASSIS

GENERAL ELECTRIC MODELS 17T2405, 17T2410, 17T2411, 17T2412, 21C2440, 21C2441, 21C2445, 21C2446, 21T2419, 21T2420, 21T2421, 21T2425, 21T2426 & UHF (M4 Line)

FOLDER 2



VIDEO IF PRINTED BOARD - RESISTOR INDUCTOR IDENT



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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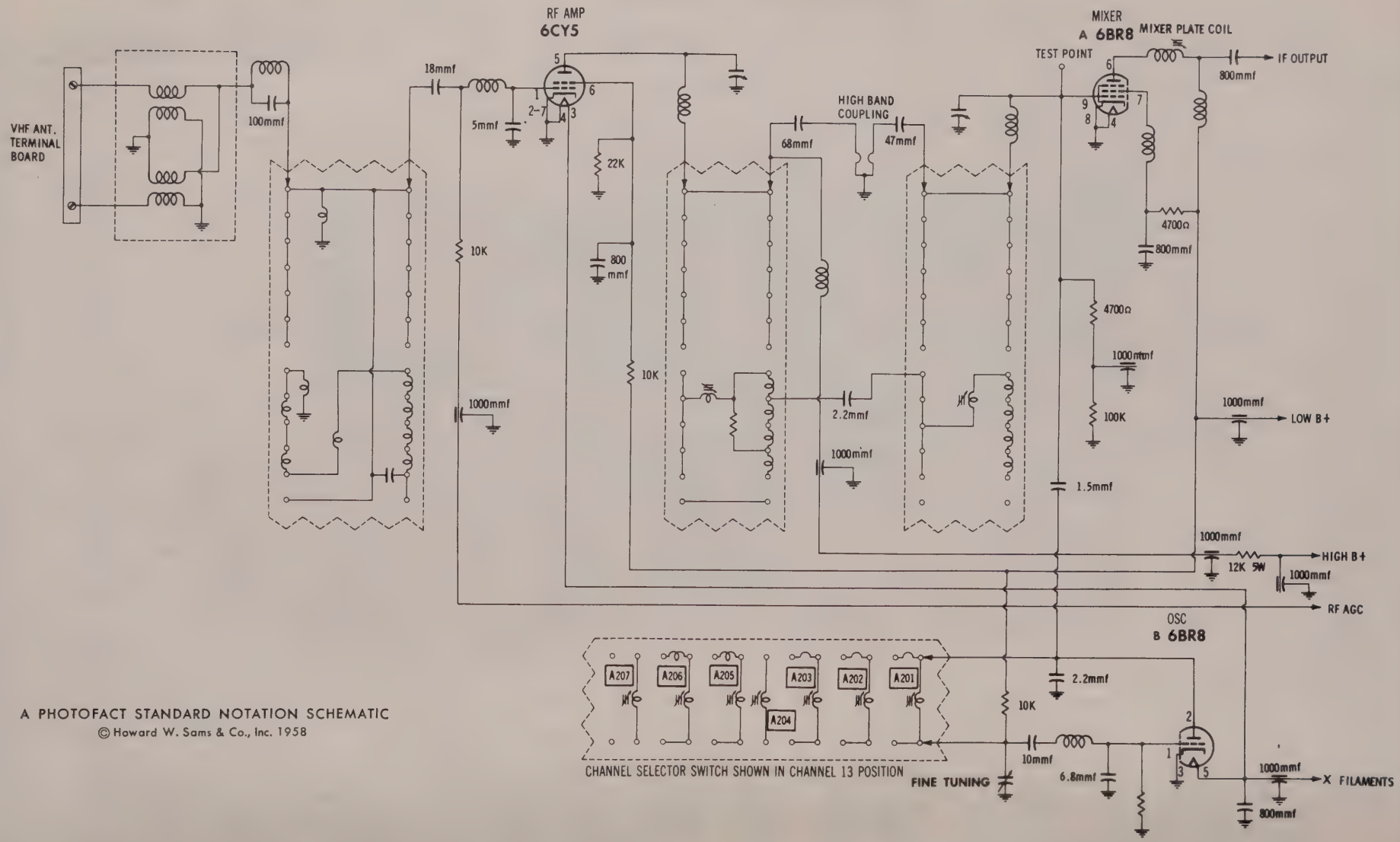
VHF TUNER W/UHF PROVISIONS #WT86X70

GENERAL ELECTRIC MODELS 17TA03, 17TA10, 17TA11, 17TA12, 21C440, 21C441, 21C445, 21C446, 21TA19, 21TA20, 21TA21, 21TA23, 21TA25 & UHF (M4 Unc)



A PHOTOFACT STANDARD NOTATION SCHEMATIC

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VHF TUNER #WT86X71

ALIGNMENT INSTRUCTIONS (cont)

TUNER WT86X67–WT86X68

VHF RF AND MIXER ALIGNMENT

Connect the negative lead of a 3 volt bias supply to point Ⓣ. Positive to chassis.
Disconnect IF link at IF end and terminate with a 68Ω resistor at the open end only.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough sweep generator output to provide a usable pattern on scope.
Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.
Use 10MC sweep unless otherwise noted.
When making the following adjustments, it may be necessary to change bandwidth. This is accomplished by changing position of the "Gimmick" (A213) with respect to the adjacent capacitor.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
2.	Fig. 201	Across antenna terminals thru matching network (Fig. 201).	213MC	211.25MC 215.75MC	13	Vert. Amp. thru 10K to point Ⓤ. Low side to chassis.	A214, A215, A216, A217	Adjust for maximum gain and symmetry of response similar to Fig. 203 with markers as shown. Adjust A214 for proper frequency of curve and A215 for proper tilt.
2.	"	"	207MC	205.25MC 209.75MC	12	"	A218, A219, A220	Adjust in numerical order. First coil for proper frequency, second for tilt and third coil for maximum gain and response similar to Fig. 203.
4.	"	"	201MC	199.25MC 203.75MC	11	"	A221, A222, A223	"
5.	"	"	195MC	193.25MC 197.57MC	10	"	A224, A225, A226	"
6.	"	"	189MC	187.25MC 191.75MC	9	"	A227, A228, A229	"
7.	"	"	183MC	181.25MC 185.75MC	8	"	A230, A231, A232	"
8.	"	"	177MC	175.25MC 179.75MC	7	"	A233, A234, A235	"
9.	"	"	85MC	83.25MC 87.75MC	6	"	A236, A237, A238	"
10.	"	"	79MC	77.25MC 81.75MC	5	"	A239, A240, A241	"
11.	"	"	69MC	67.25MC 71.75MC	4	"	A242, A243, A244	"
12.	"	"	63MC	61.25MC 65.75MC	3	"	A245, A246, A247	"
13.	"	"	57MC	55.25MC 59.75MC	2	"	A248, A249, A250	"

UHF IF ALIGNMENT FOR TUNER #WT86X68

Connect the negative lead of a 3 volt bias supply to point Ⓣ. Positive to chassis.
Disconnect the IF link at the IF end and terminate with a 68Ω resistor at the open end only.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
Use only enough sweep generator output to provide a usable pattern on scope.
Coils not containing adjustable cores are adjusted by expanding or compressing coil turns.
Remove the Germanium Diode from the UHF Tuner.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
14.	Fig. 204	High side to point Ⓥ. Low side to chassis.	43.0MC (10MC Swp)	40.5MC 45.75MC	UHF	Vert. Amp. thru 10K to point Ⓤ. Low side to chassis.	A251, A252, A253	Adjust A251 for maximum gain at 40.5MC, A252 for maximum gain at 45.75MC and A253 for maximum overall gain and MINIMUM tilt.

TUNER PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amp.	6CY5	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	6CL8	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	G.E. PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	5		WT18X148	DI 5	DD-050	L10V5	ZT-555	5GA-V5	
C202	15		WT18X294						
C203	1000		WT23X4						
C204	.56		WT21X30						±.5mmf
C205	.91		WT21X11						±.5mmf
C206	1.3		WT21X31						±.5mmf
C207	47		WT18X253	BPD-000047	DD-470	L10Q47	UC-5447	5GA-Q47	
C208	1000		WT18X255						
C209	1000		WT18X255						
C210	1000		WT18X358	BPD-001	DD-102	BYA6DI	DC521	5HK-DI	
C211	1000		WT18X358	BPD-001	DD-102	BYA6DI	DC521	5HK-DI	
C212	.39		WT21X27						±.5mmf
C213	1.5		WT18X256						
C214	20			NPO-SI 20	TCZ-20	CTA6Q2C	ZT-542	5TCC-Q2	NPO 10%
C215	2		WT21X19	NPO-SI 2					±.5mmf
C216	1000		WT18X358	BPD-001	DD-102	BYA6DI	DC521	5HK-DI	
C217									
C218	1000		WT18X255						
C219	1000		WT18X255						
C220	10		WT18X320		TCA-10				N330 5%
C221	1.5		WT18X319						N75
C222			WT30X43						
C223	1000		WT23X4						

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		G.E. PART No.	NOTES
	OHMS	WATT		
R201	12K			
R202	12K	5	WT14X104	
R203	10K			
R204	22K			

ITEM No.	RATING		G.E. PART No.	NOTES
	OHMS	WATT		
R205	15K			
R206	220K			
R207	15K			
R208	8200Ω			

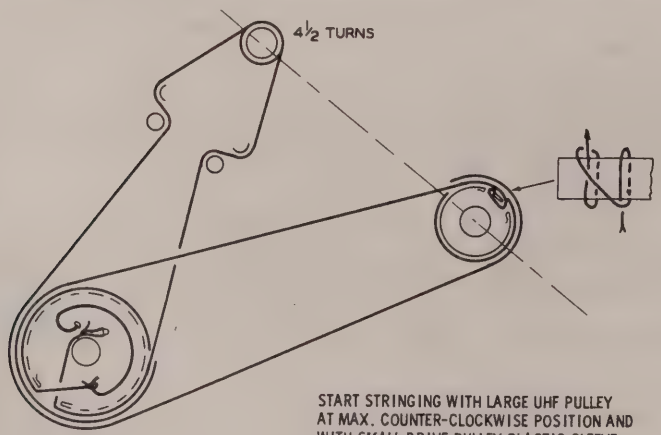
COILS (RF-IF)

ITEM No.	USE	G.E. PART No.	NOTES
L201	Ant. Trans.	WT37X12	
L202	Ant. Coils	WT52X123	Channel 2-13, Includes wafer assy.
L203	RF Coils	WT52X124	Channel 2-13, Includes wafer assy.
L204	Mixer Grid Coils	WT52X125	Channel 2-13, Includes wafer assy.

ITEM No.	USE	G.E. PART No.	NOTES
L205	Osc. Coils	WT52X126	Channel 2-13, Includes wafer assy.
L206	Channel 6 Osc.	WT36X288 †	
L207	Channel 13 Osc.	WT36X319 †	
L208	Mixer Plate Coil	WT36X289	
L209	RF Choke	WT36X338	260 Microhenries, 5%, Note 1

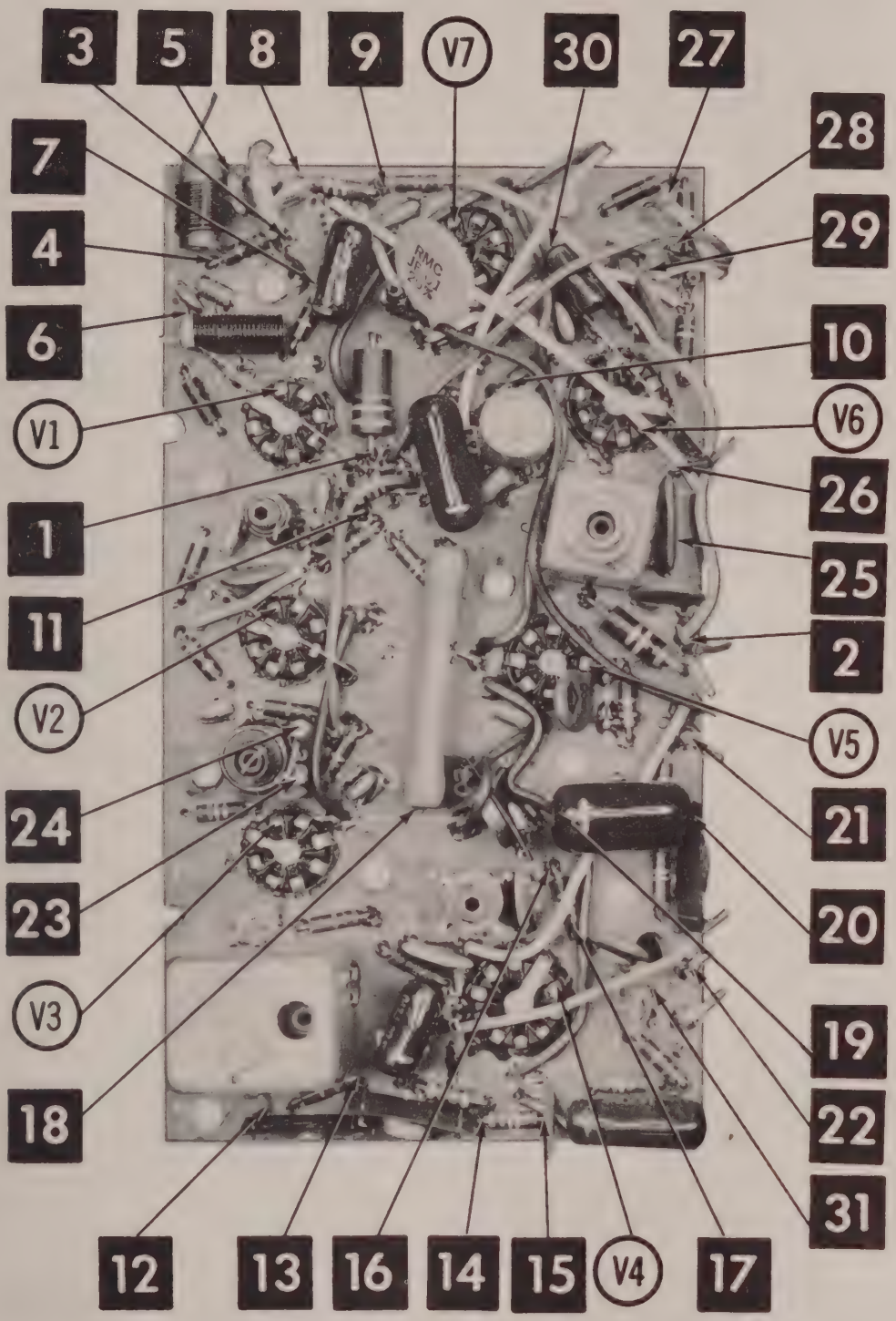
† Part of L205.

Note 1. Later versions use 310 Microhenries, 5% (Part #WT36X399).



START STRINGING WITH LARGE UHF PULLEY AT MAX. COUNTER-CLOCKWISE POSITION AND WITH SMALL DRIVE PULLEY PLASTIC SLEEVE TAB AT 3 O'CLOCK (VIEWED FROM FRONT OF TUNER)

UHF DRIVE CORD STRINGING



A Howard W. Sams CIRCUITRACE* Photo
*TRADE MARK

VIDEO IF
PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED

GENERAL ELECTRIC MODELS 17T2403, 17T2410, 17T2411, 17T2412, 21C2440, 21C2441, 21C2445, 21C2446, 21T2419, 21T2420, 21T2421, 21T2423, 21T2426 & UHF (M4 Line)

FOLDER 2

RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AU6A	520K	0Ω	.1Ω	0Ω	▲100Ω	▲100Ω	56Ω		
V2	6AU6A	230K	260K	.1Ω	0Ω	† 220Ω	† 220Ω	▲ 47Ω		
V3	6CB6A	.1Ω	150Ω	.1Ω	0Ω	■ 220Ω	■220Ω	0Ω		
V4	6CX8	0Ω	2meg	■ 20K	.1Ω	0Ω	75Ω	1meg	■0Ω	† 4500Ω
V5	6AU6A	2.5Ω	0Ω	.1Ω	0Ω	■ 10K	■10K	270Ω		
V6	6T8	INF	22K	INF	0Ω	.1Ω	430K	0Ω	6.8meg	† 680K
V7	6CU5	¶	240K	.1Ω	0Ω	240K	† 330Ω	† 600Ω		
V8	6DN7	• 2.2meg	‡2500Ω	0Ω	• 900K	•‡3.5meg	0Ω	.1Ω	0Ω	
V9	6CG7	† 15K	2meg	820Ω	.1Ω	0Ω	† 73K	62K	820Ω	0Ω
V10	6DQ6A	TP	.1Ω	NC	† 10K	820K	TP	0Ω	0Ω	TOP CAP ‡26.5Ω
V11	6AX4GT	NC	NC	¶ 200K	NC	† 0Ω	NC	.1Ω	0Ω	
V12	1J3GT	PINS	1 THRU 8	HAVE	INFINITE	RESISTANCE				TOP CAP ‡356Ω
V13	5U4GB	NC	¶	NC	34Ω	NC	31Ω	NC	¶	
V14	21DEP4	0Ω	47K	‡850K	100K	NC	NC	• 220K	.1Ω	
V201	6CY5	420K	0Ω	0Ω	.1Ω	† 12K	■8500Ω	0Ω		
V202	6CL8	15K	■ 10K	0Ω	0Ω	.1Ω	■.2Ω	■ .1Ω	0Ω	235K
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.

• THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION.

▲ MEASURED FROM PIN 2 OF V2.

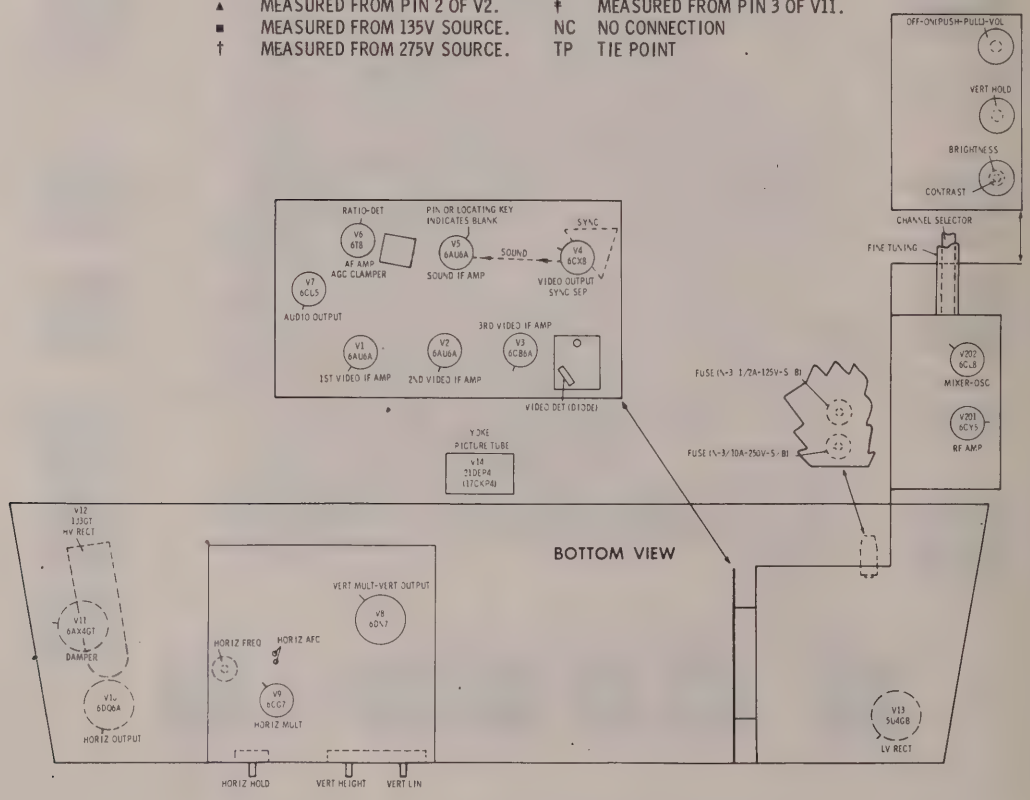
■ MEASURED FROM 135V SOURCE.

† MEASURED FROM 275V SOURCE.

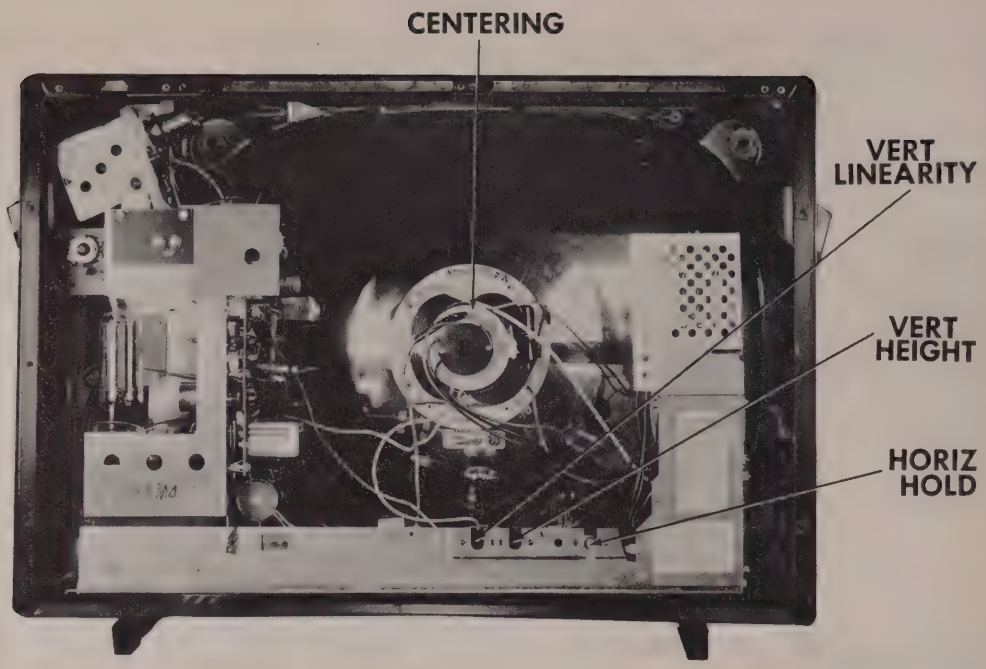
‡ MEASURED FROM PIN 3 OF V11.

NC NO CONNECTION

TP TIE POINT



TUBE PLACEMENT CHART



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and tune in a TV signal, preferably a test pattern.

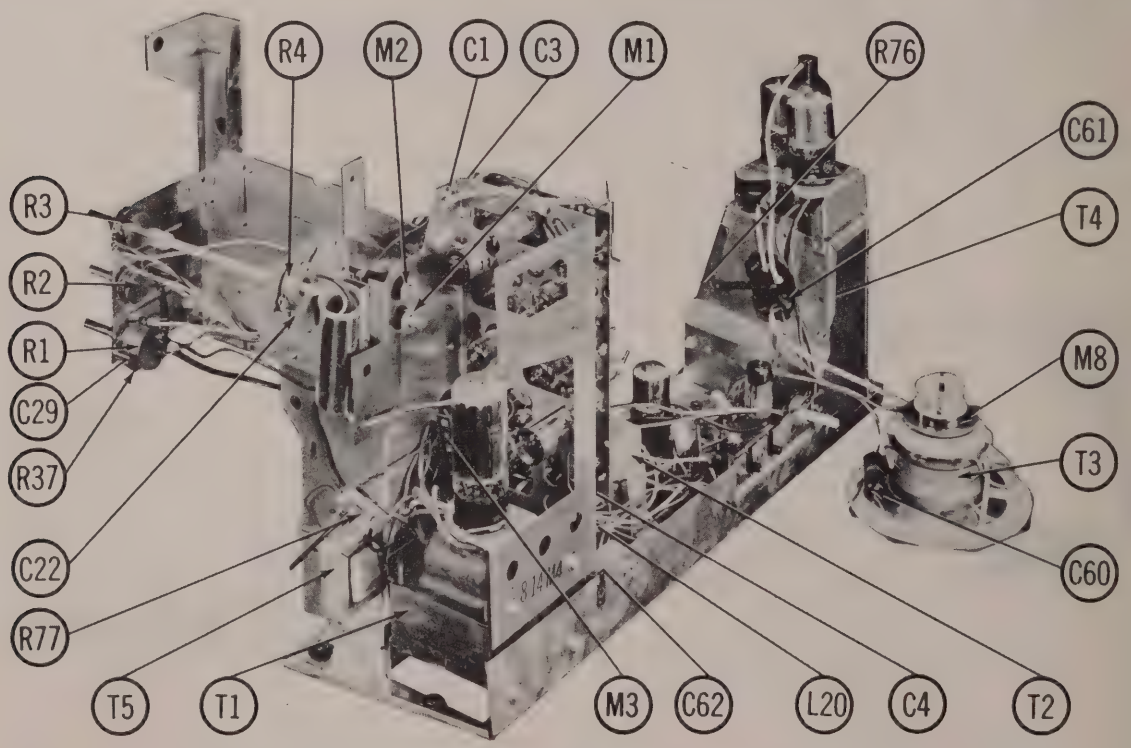
Connect a clip lead from point (F) to chassis.

Connect a 1000Ω resistor across the Horizontal Frequency Coil (L19).

Adjust the Horizontal Hold to a point where the picture appears to float back and forth across the screen.

Remove the resistor from across L19 and adjust the Horizontal Frequency slug (B1) until the picture again floats back and forth.

Remove the clip lead from point (F) and chassis. Readjust Horizontal Hold, if necessary.



CHASSIS—REAR VIEW

DISASSEMBLY INSTRUCTIONS

CHASSIS REMOVAL

1. Remove push-on type knobs from the front.
2. Remove 2 wood screws holding the rear cover. Remove the rear cover.
3. Remove the picture tube socket, HV lead, yoke plug and speaker leads.
4. Remove 1 top chassis bolt.
5. Remove 4 bottom chassis bolts.
6. Remove the chassis.

MODEL TY-103 (CH. GY)

TRADE NAME	Olympic	MODEL	CHASSIS
		TY103	GY
		TY103U	GYU
MANUFACTURER	Olympic Radio & Television Inc., 34-01 38th. Avenue, Long Island City, 1, N.Y.		
TYPE SET	Television		
TUBES	Thirteen		
POWER SUPPLY	110-120 Volts AC, 60 Cycle	RATING 150 Watts, 1.43 Amp. @ 117 Volts AC	
TUNING RANGE	Channels 2 thru 13 VHF, 14 thru 83 UHF, Video IF 45.75MC, Sound IF 41.25MC (Intercarrier)		

SERVICING IN THE FIELD

TUNER OSCILLATOR ADJUSTMENTS

Touch-up adjustment of the VHF Oscillator is possible by removing the Channel Selector and Fine Tuning knobs. Set the Fine Tuning at the center of its range. One slug for HIGH band adjustment is located at 10 o'clock, and should be adjusted first. The LOW band adjustment is located at 7 o'clock. Adjust for best picture and sound.

PICTURE TUBE SAFETY GLASS CLEANING

Remove 4 wood screws from the trim strip at the top edge of the safety glass. Tilt glass out at the top and lift up to remove.

SPECIAL ADJUSTMENTS

A. Focus
The focus may be varied by the position of the strap on the base of the Picture Tube. The strap can be connected between pins 6 and 1, or 6 and 10.

B. Height & Vert. Lin.
These adjustments are accessible by removing the Channel Selector and Fine Tuning knobs.

HORIZONTAL OSCILLATOR FIELD ADJUSTMENT

For adjustment of the Horizontal Oscillator, it is necessary to remove the rear cover and supply power to set. Set the Horizontal Hold at the center of its range and adjust the Horizontal Frequency slug (B1) until the picture synchronizes horizontally. (For location, see tube placement chart.)

FUSES

One fuse is used for horizontal sweep circuit protection. (For location, see tube placement chart.)

CENTERING

Centering is accomplished mechanically by adjusting two magnetic rings around the neck of the picture tube. Rotate the two rings around the neck of the tube until the picture is properly centered.

OLYMPIC MODELS TY103, TY103U (Ch. GY, GYU)

SET 416 FOLDER 3

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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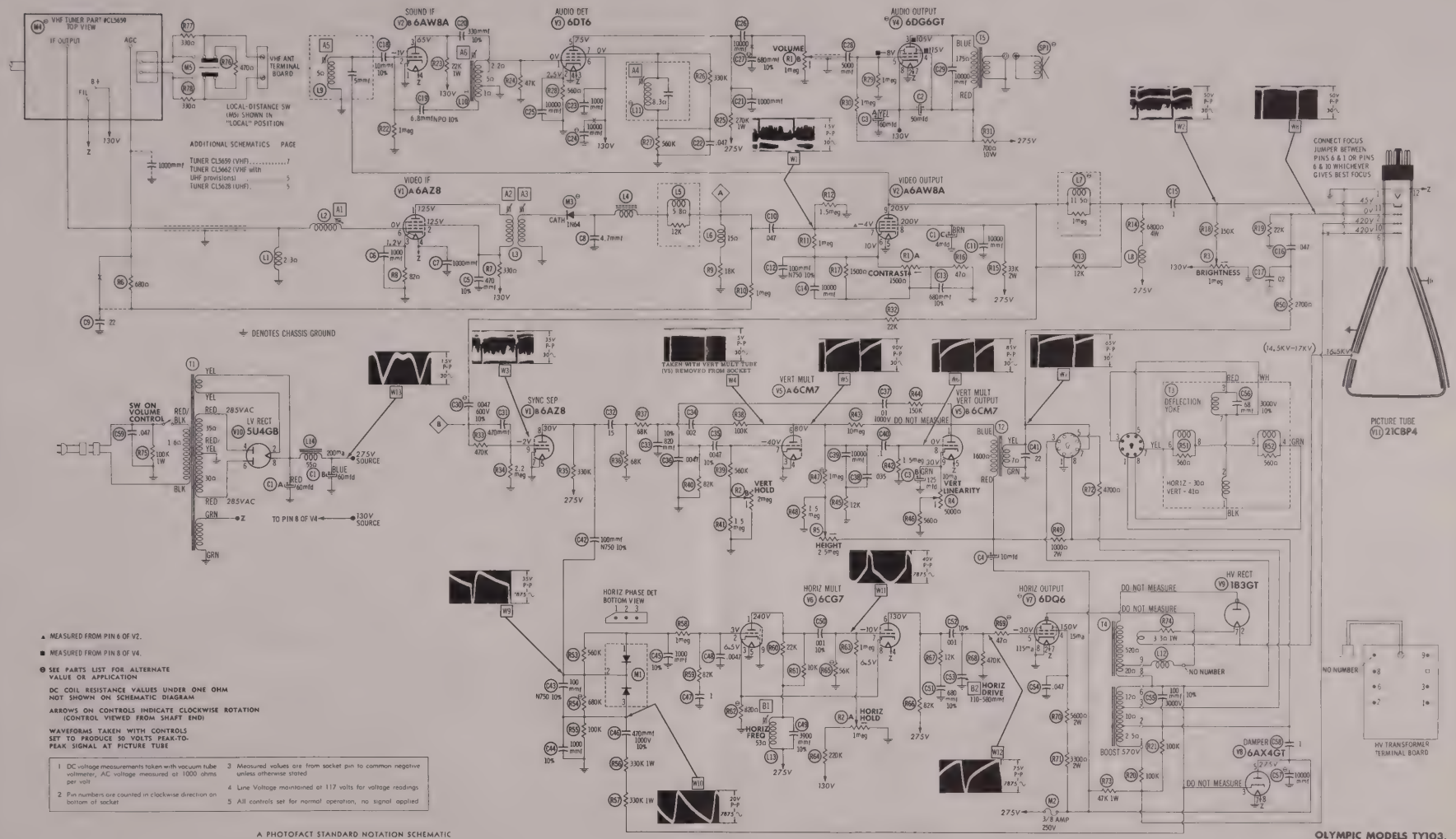
H703



▲ MEASURED FROM PIN 6 OF V2.

■ MEASURED FROM PIN 8 OF V4.

⊛ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

WAVEFORMS TAKEN WITH CONTROLS SET TO PRODUCE 50 VOLTS PEAK-TO-PEAK SIGNAL AT PICTURE TUBE

1 DC voltage measurements taken with vacuum tube voltmeter. AC voltage measured at 1000 ohms per volt

2 Pin numbers are counted in clockwise direction on bottom of socket

3 Measured values are from socket pin to common negative unless otherwise stated

4 Line Voltage maintained at 117 volts for voltage readings

5 All controls set for normal operation, no signal applied

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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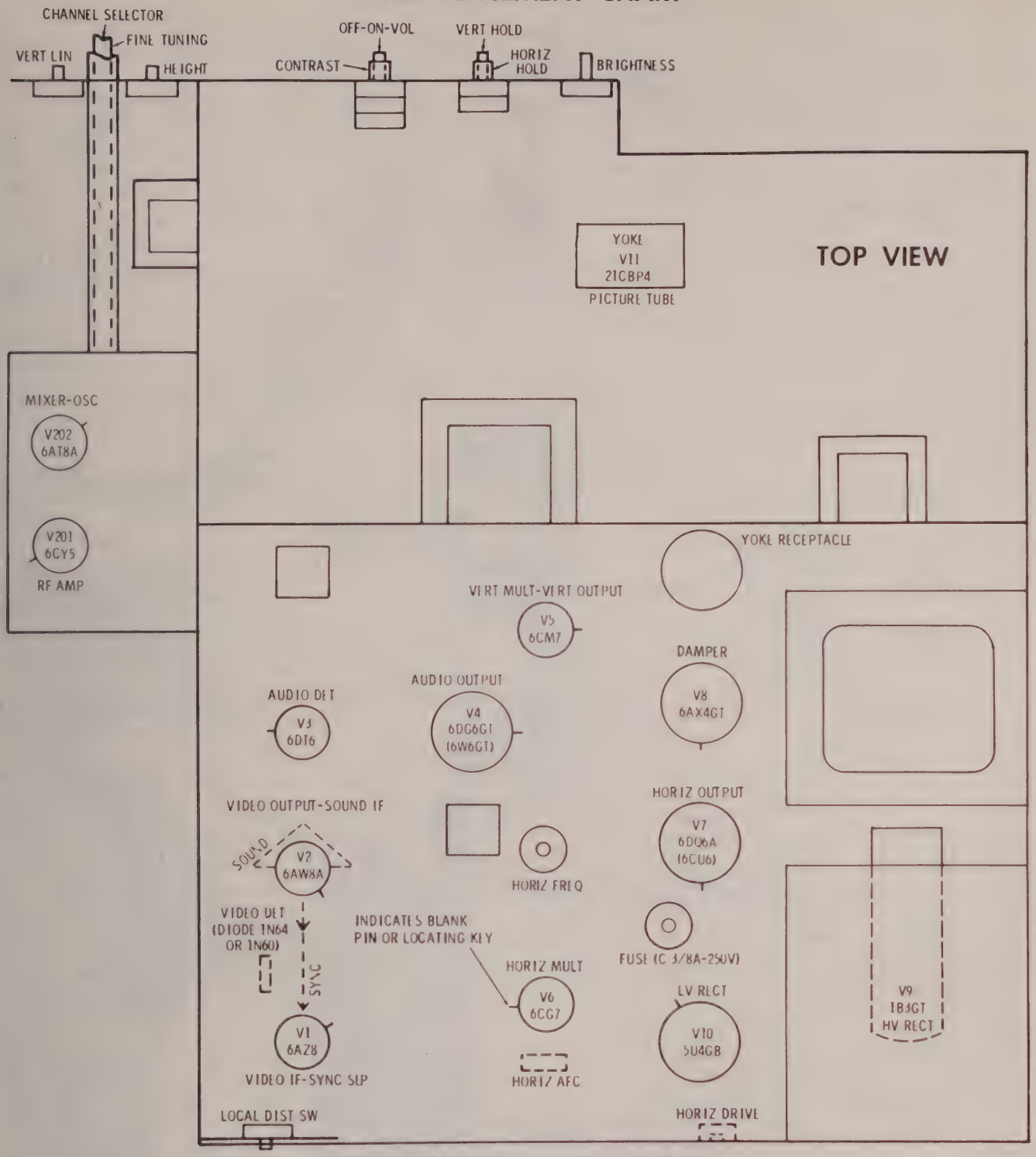
OLYMPIC MODELS TY103, TY103U (Ch. GY, GYU)

TUBE PLACEMENT CHART



TUBE FAILURE CHECK CHART

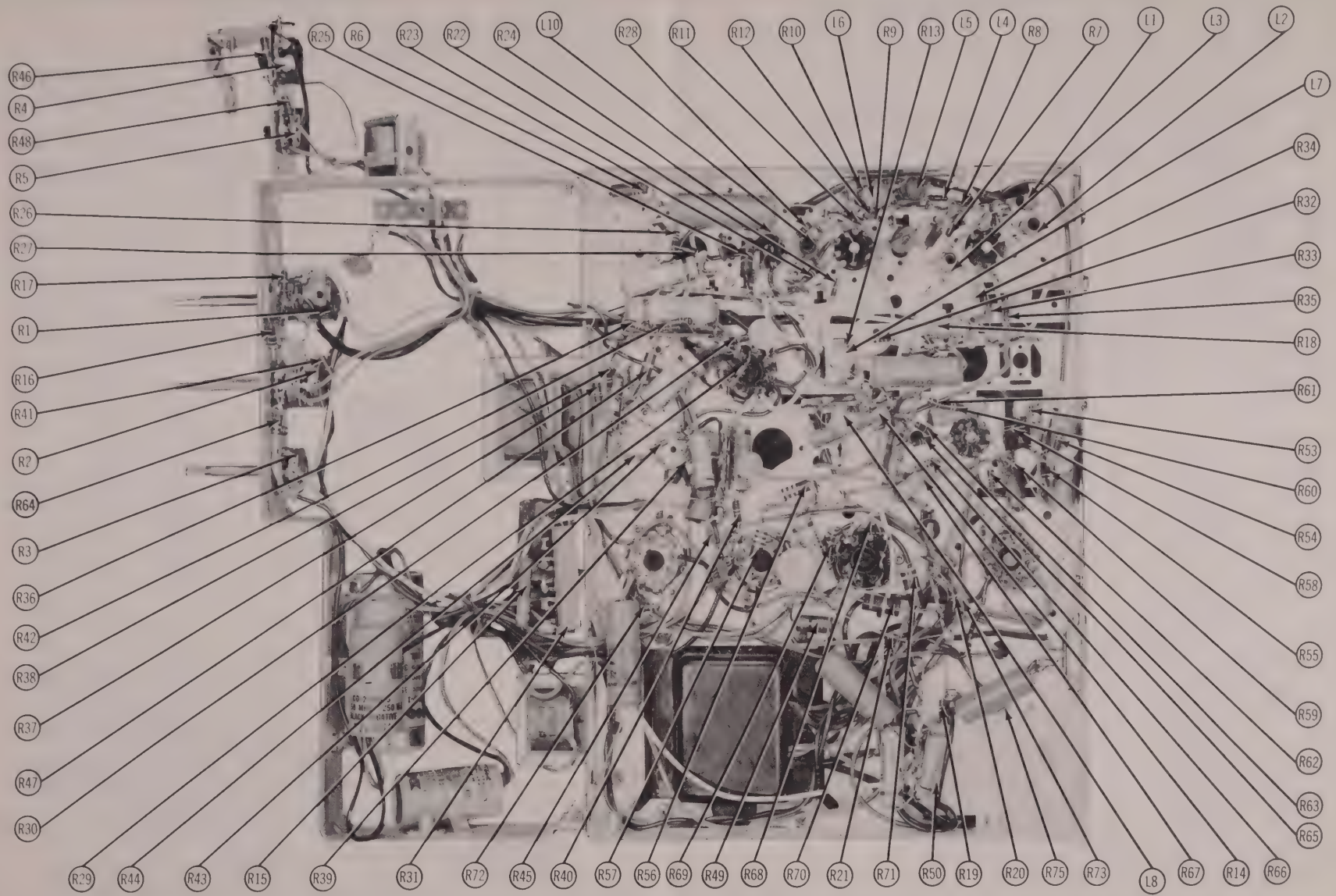
The following chart lists tubes whose failures are most likely to produce indicated symptoms. Refer to tube placement chart for location and type of tube.

POWER SUPPLY FAILURE
No raster, no sound V10

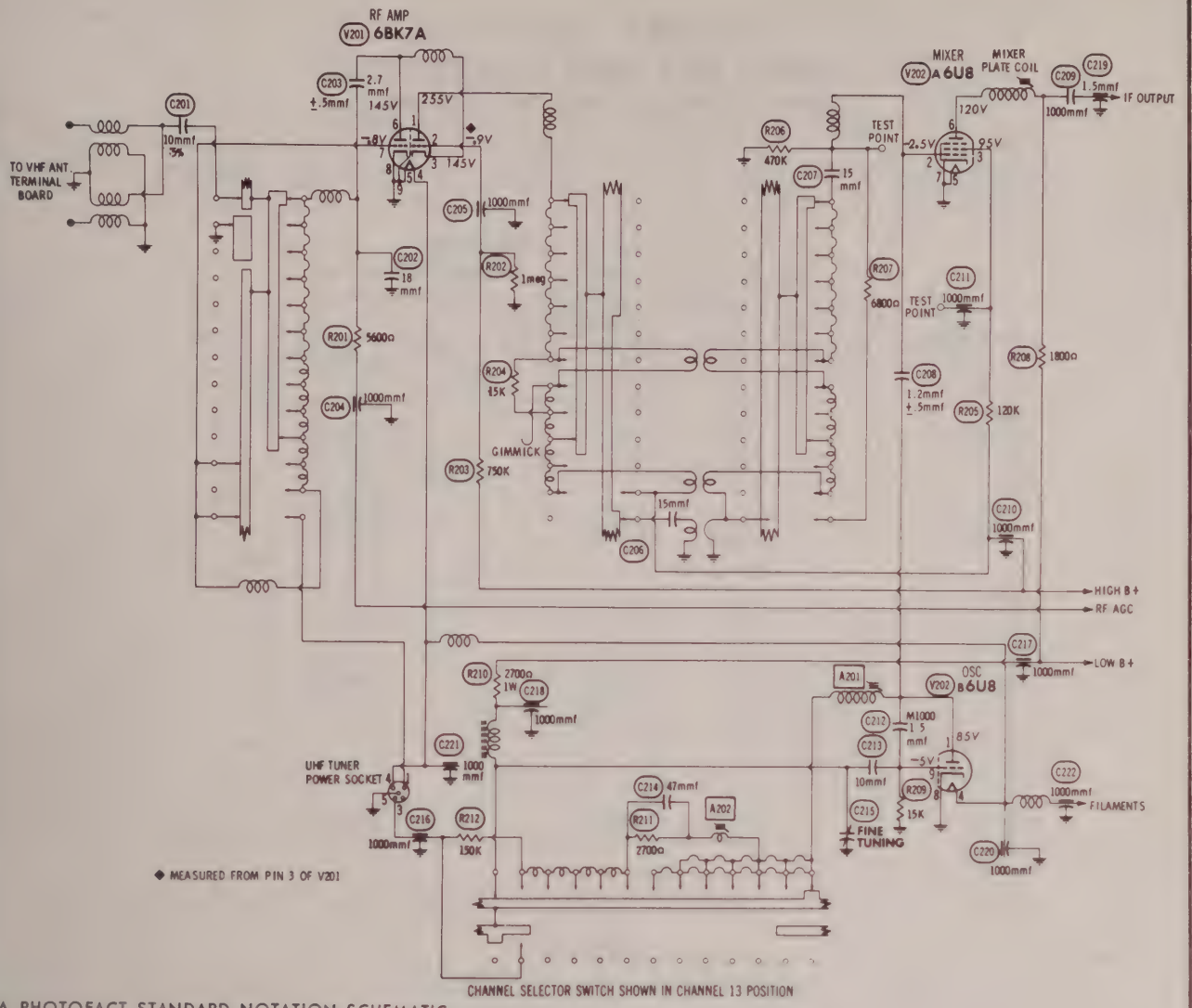
SWEEP FAILURE
No raster, has sound Fuse (M2), Rectifier (M1), V6, V7, V8, V9, V11
No vertical deflection V5
Poor vert. linearity or foldover V5
Poor horiz. linearity or foldover V6, V7, V8
Narrow picture V6, V7, V8, V10
Vert. off freq. V5
Horiz. off freq. V6

LOSS OF PICTURE OR SOUND
No pic, no sound, has raster V1, V2
No pic, no sound, has snow V201, V202
No pic, has sound, has raster V2, V11
Has pic, no sound V2, V3, V4

SYNC FAILURE
No vert. sync V1
No horiz. sync V1, M1
No vert. or horiz. sync V1



CHASSIS BOTTOM VIEW-RESISTOR AND INDUCTOR IDENTIFICATION



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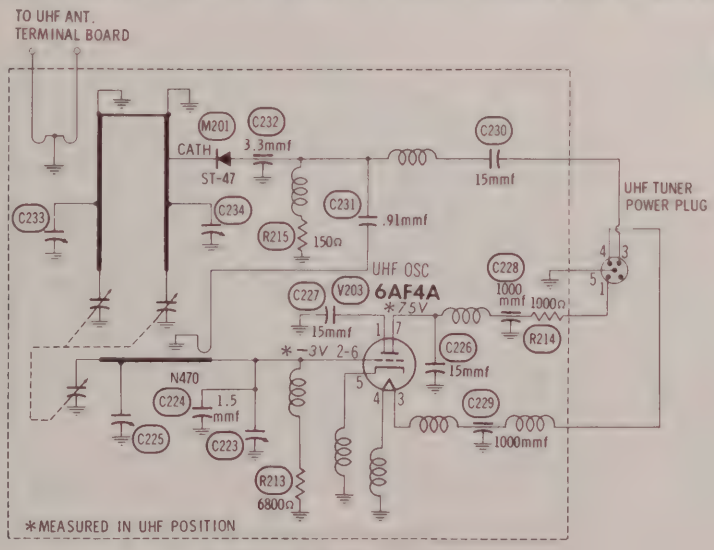
VHF TUNER WITH UHF PROVISIONS #CL5662



UHF TUNER PART #CL5825

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UHF TUNER #CL5825

TUNER CL5662–CL5825
PARTS LIST AND DESCRIPTIONS
TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amp.	6BK7B	
V202	Mixer-Osc.	6U8	

ITEM No.	USE	TYPE	NOTES
V203	UHF Osc.	6AF4A	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	OLYMPIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	10				TCZ-10				5%
C202	18			DI 18	DD-180	L10Q18	UC-5418	5GA-Q18	
C203	2.7								±.5mmf
C204	1000			EF-001	MFT-1000			503C-D1	
C205	1000			EF-001	MFT-1000			503C-D1	
C206	15			BPD-000015	DD-150	L10Q15	UC-5415	5GA-Q15	
C207	15			BPD-000015	DD-150	L10Q15	UC-5415	5GA-Q15	
C208	1.2								±.5mmf
C209	1000			BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C210	1000			EF-001	MFT-1000			503C-D1	
C211	1000			EF-001	MFT-1000			503C-D1	
C212	1.5								N1000
C213	10			BPD-00001	DD-100	L10Q1	UC-541	5GA-Q1	
C214	47			BPD-000047	DD-470	L10Q47	UC-5447	5GA-Q47	
C215									
C216	1000			EF-001	MFT-1000			503C-D1	
C217	1000			EF-001	MFT-1000			503C-D1	
C218	1000			EF-001	MFT-1000			503C-D1	
C219	1.5								
C220	1000			EF-001	MFT-1000			503C-D1	
C221	1000			EF-001	MFT-1000			503C-D1	
C222	1000			EF-001	MFT-1000			503C-D1	
C223									
C224	1.5								N470
C225									
C226	15								
C227	15								
C228	1000			EF-001	MFT-1000			503C-D1	
C229	1000			EF-001	MFT-1000			503C-D1	
C230	15			BPD-000015	DD-150	L10Q15	UC-5415	5GA-Q15	
C231	.91								
C232	3.3								
C233									
C234									

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		OLYMPIC PART No.	NOTES
	OHMS	WATT		
R201	5600Ω			
R202	1meg			
R203	750K			
R204	15K			
R205	120K			
R206	470K			
R207	6800Ω			
R208	1800Ω			

ITEM No.	RATING		OLYMPIC PART No.	NOTES
	OHMS	WATT		
R209	15K			
R210	2700Ω	1		
R211	2700Ω			
R212	150K			
R213	6800Ω			
R214	1000Ω			
R215	150Ω			

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		OLYMPIC PART No.	CBS PART No.	SYLVANIA PART No.	
M201	ST-47		1N82A	1N82A	UHF Mixer (Clip-in)

TUNER ALIGNMENT INSTRUCTIONS

TUNER #CL5662

VHF OSCILLATOR ALIGNMENT

Set the fine tuning to the center of its range (flat of fine tuning shaft is at right angles to top of tuner). Set the Channel Selector to the highest high band channel (13-7) operating in the area. Adjust the high band oscillator adjustment slug (A201) for best picture and sound. Switch Channel Selector to the highest low band channel (6-2) operating in the area and adjust the low band oscillator adjustment(A202) for best picture and sound. Recheck high band adjustment.

VHF RF AND MIXER ALIGNMENT

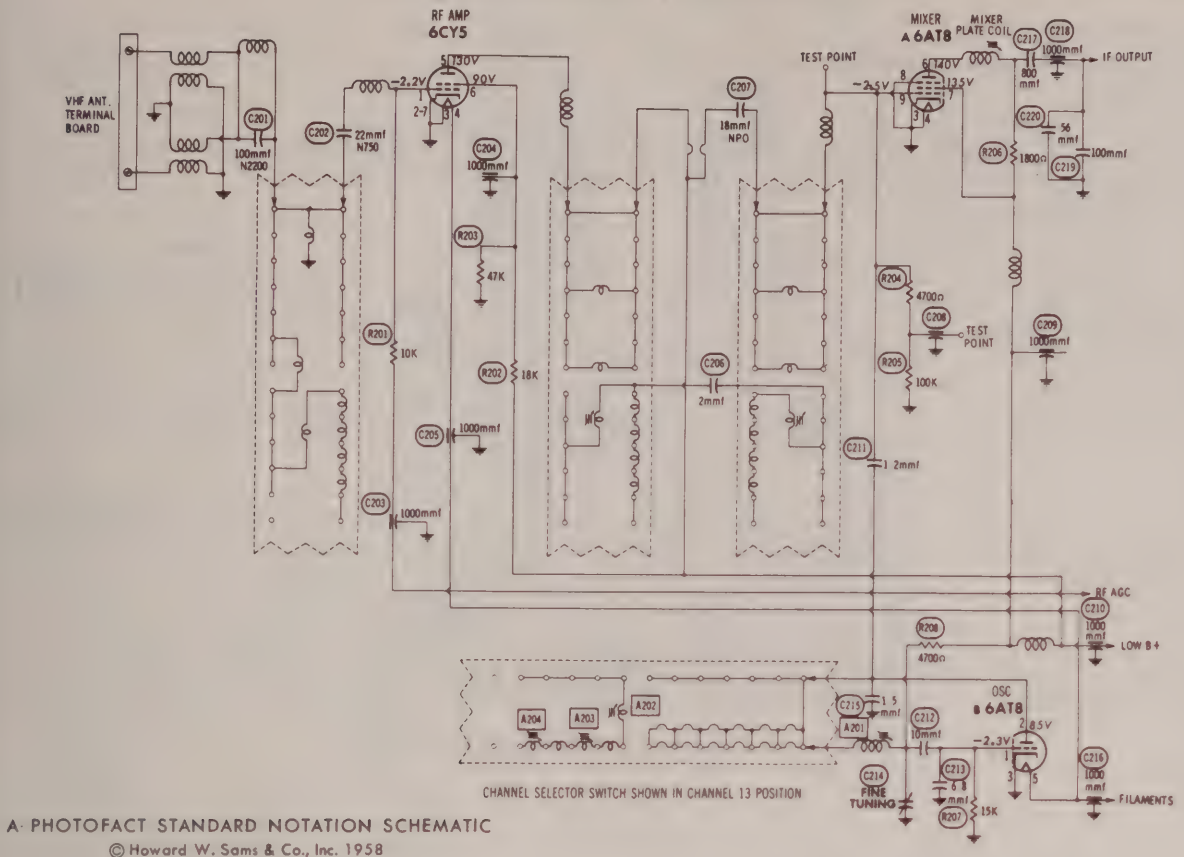
This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.

UHF TUNER DIAL ALIGNMENT

Turn the VHF tuner to UHF position and turn the fine tuning (UHF tuning) fully counterclockwise. Remove the VHF Channel Selector and Fine Tuning knobs and the UHF dial, but do not turn shaft. Replace the UHF dial so that the number 80 will be visible thru the UHF window in the VHF Channel Selector knob. Replace the Fine Tuning and VHF Channel Selector knobs.

UHF TUNER ALIGNMENT

This portion of the receiver has been properly aligned at the factory and is very stable. Alignment of this portion should not be required in the field.



A- PHOTOFACT STANDARD NOTATION SCHEMATIC

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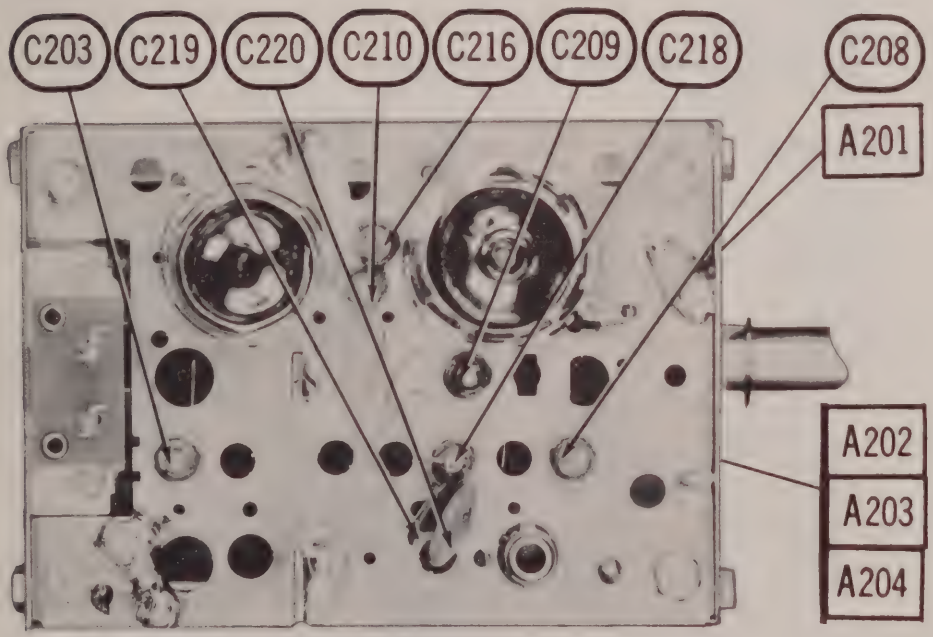
VHF TUNER #CL5659



TUNER #CL5659 - TOP VIEW

ALIGNMENT INSTRUCTIONS

PRE-ALIGNMENT INSTRUCTIONS

USE AN ISOLATION TRANSFORMER TO PROTECT THE TEST EQUIPMENT.

VIDEO IF ALIGNMENT

Connect variable to IF AGC line. Adjust bias to obtain response curve which shows no indication of overloading.
Connect the synchronized sweep voltage from the sweep generator to the horizontal input of the oscilloscope for horizontal deflection.
The sweep generator output lead should be terminated with its characteristic impedance, usually 50 ohms.
Use only enough sweep generator output to provide a usable pattern on scope.
Use 10MC sweep unless otherwise noted.

	DUMMY ANTENNA	SWEEP GENERATOR COUPLING	SWEEP GENERATOR FREQUENCY	MARKER GENERATOR FREQUENCY	CHANNEL	CONNECT SCOPE	ADJUST	REMARKS
1.	.05mfd	High side to ungrounded tube shield floating over Mixer-Osc. tube (V202). Low side to chassis.	44MC	43.25MC 45.75MC	Any non-interfering channel	Vert. Amp. thru detector (Fig. 1) to pin 1 (plate) of 1st. Video IF (V1). Low side to chassis.	A1 and Mixer Plate Coil	Adjust for maximum gain and symmetry of response similar to Fig. 2 with markers as shown.
2.	"	High side to pin 6 (grid) of 1st. Video IF (V1). Low side to chassis.	"	43.25MC 44.5MC 45.75MC	"	Vert. Amp. thru 10K to point (A). Low side to chassis. (Across Video Det. load)	A2, A3	Adjust for maximum gain and symmetry of response similar to Fig. 3 with markers as shown.
3.	"	High side to ungrounded tube shield floating over Mixer-Osc. tube (V202). Low side to chassis.	"	43.25MC 44.5MC 45.75MC	"	"		Check for response similar to Fig. 4. If necessary, retouch Mixer Plate Coil and A1 thru A3.

SOUND IF ALIGNMENT

Turn the set on and tune in a strong TV signal. Adjust A4 for maximum volume. Disconnect the antenna and if necessary, insert an attenuator in series with the antenna to provide a weak signal. Adjust A5 and A6 for maximum volume. (A weak signal is necessary to make the peaks distinguishable.) Reconnect antenna directly for a strong signal and retouch A4 for maximum undistorted sound.

TUNER ALIGNMENT INSTRUCTIONS LOCATED ON PAGES 6 & 13

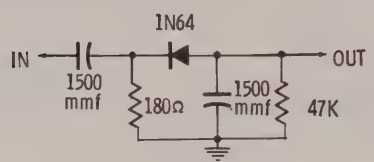


FIG. 1

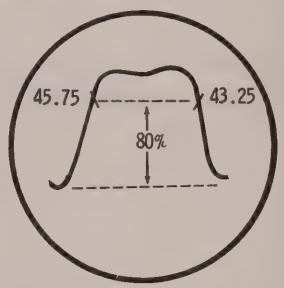


FIG. 2

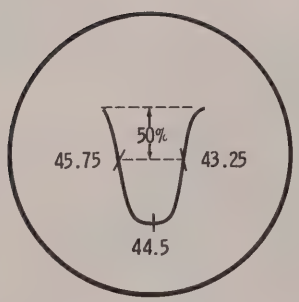


FIG. 3

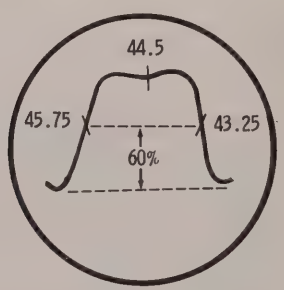
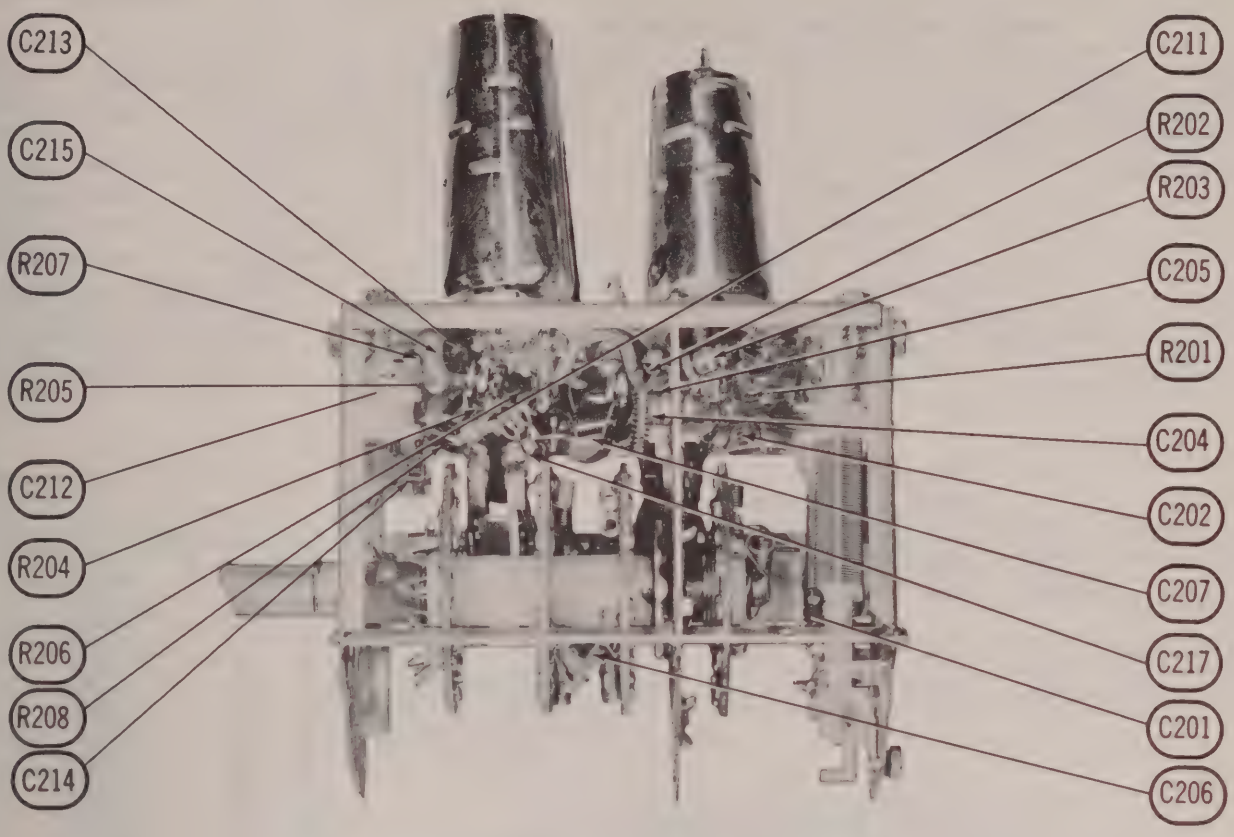
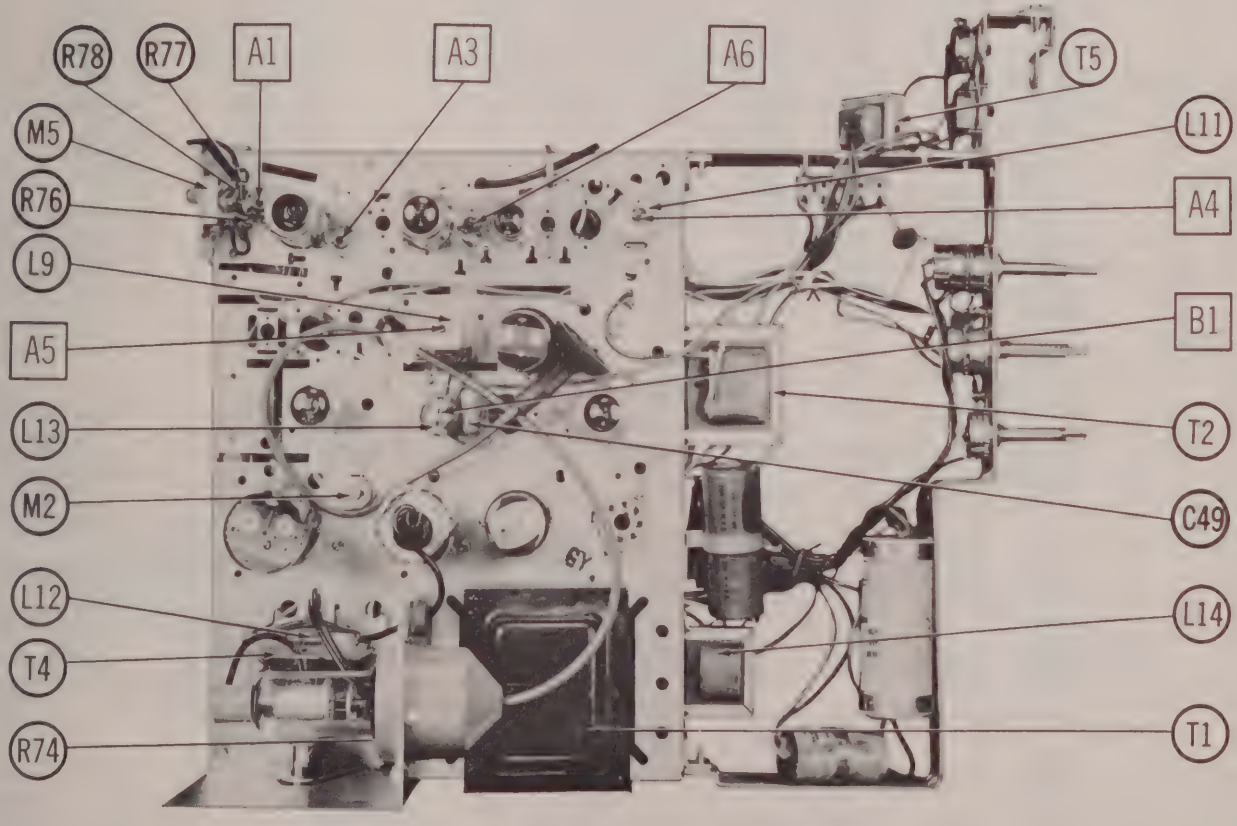


FIG. 4



TUNER #CL5659 - SIDE VIEW



CHASSIS TOP VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No	USE	TYPE	NOTES
V1	Video IF Amp. -Sync Sep.	6AZ8	
V2	Video Output-Sound IF Amp	6AW8A	
V3	Audio Det.	6DT6	
V4	Audio Output	6DG8GT	6W8GT *
V5	Vert. Mult. -Vert. Output	6CM7	

ITEM No	USE	TYPE	NOTES
V6	Horiz. Mult	6CG7	
V7	Horiz. Output	6DQ6A	6CU6 *
V8	Damper	6AX4GT	
V9	HV Rect	1B3GT	
V10	LV Rect.	5U4GB	

* Alternate.

PICTURE TUBE

ITEM No	REPLACEMENT DATA				NOTES
	OLYMPIC PART No.	GENERAL ELECTRIC PART No.	RCA PART No.	SYLVANIA PART No.	
V11	21CBP4		21CBP4-A ①	21CBP4/ 21CBP4A ②	① "Silverama" ② "Silver Screen 85"

ELECTROLYTIC CAPACITORS

ITEM No	RATING		REPLACEMENT DATA						
	CAP.	VOLT	OLYMPIC PART No	AEROVOX PART No.	CORNELL-DUBILIER PART No	MALLORY PART No	PYRAMID PART No	SANGAMO PART No	SPRAGUE PART No.
C1A	60	350	CO-3380-1	PR3-025	BBRT0235	WT460	TD-50-450	FM-4550	TVA-1713
B	60	350						T-317	R2084 *
C	4	350						MT-05100	
C2	50	250	CO-2068-3	PR3250V50	BR5025	TC59	TD-50-450	MT-4510	TVA-1705
C3A	60	200	CO-3856	PR2-200	BBRD0587	WD340			
B	125	50							
C4	10	450	CO-4022-2	PR3450V10	BR1045	TC72	TD-10-450		TVA-1705

* Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	OLYMPIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C3	470		CCD471K		MD-471				10%
C6	1000		CCD102M	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C7	1000		CCD103M	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C8	4.7		CC4S3	NPO-SI 4.7	TCS-4R7	CTA6Y47C	ZT-5547	5TCCB-V47	
C9	.22	300	CO-B-2234	P388N-22		CUB2P22	GEM-2022	2TM-P22	
C10	.047	400	CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C11	10000		CCD103M	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C12	100		CCD101K	N750-D1 100	DTN-100	CTA6T1U	NT-531	5TCU-T1	N750 10%
C13	680		RCM20A681K	1469-00068	MD-681	IR5T68		MS-368	10%
C14	10000		CCD103M	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C15	.1	400	CO-H-4104	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C16	.047	400	CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C17	.02	400	CO-H-4203	P488N-02	DD-203	CUB4S3	GEM-413	4TM-S3	
C18	10		CCD100K	NPO-DZ 10	DD-100	L10QI	ZT-541	5TCU-Q1	10%
C19	6.8		CC4S47	NPO-DZ 6.8	DTZ-6R8	C10V68C	ZT-5558	5TCCB-V68	NPO 10%
C20	330		CCD331M		MD-331	L10Y33			10%
C21	1000		CCD102M	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C22	.047	400	CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C23	1000		CCD102M	BPD-001	DD-102	BYA6D1	DC521	5HK-D1	
C24	10000		CCD103M	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	①
C25	10000		CCD103M	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C26	10000		CCD103M	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C27	680		RCM20A681K	1469-00068	MD-681	IR5T68		MS-368	10% ①
C28	5000		CCD502K	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C29	10000		CCD103M	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C30	.0047	600	CO-O-8472K				GEM-16347		10% ②
C31	470		CCD471M	BPD-00047	DD-471	L10T47	UC-5347	5GA-T47	
C32	.15	400		P488N-15		CUB4P15	GEM-4015	4TM-P15	
C33	820		CCD821K						10%
C34	.002	600	CO-H-6202	P688N-002	D6-202	CUB6D2	GEM-622	6TM-D2	
C35	.0047	800	CO-O-8473K				GEM-16347		10%
C36	.0047	800	CO-O-8472K	P688N-0047	D6-472	CUB6D47	GEM-6347	6TM-D47	
C37	01	1000	CO-D-2103	P1088N-01	DD-103	CUB10S1	GEM-1011	10TM-S1	
C38	035	800	CO-O-6353						
C39	10000		CCD103M	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C40	.1	400	CO-H-4104	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C41	.22	300	CO-H-2234	P288N-22		CUB2P22	GEM-2022	2TM-P22	
C42	100		CCD101K	N750-D1 100	DTN-100	CTA6T1U	NT-531	5TCU-T1	N750 10%
C43	100		CCD101K	N750-D1 100	DTN-100	CTA6T1U	NT-531	5TCU-T1	N750 10%
C44	1000		CC4S37						10%
C45	1000		CC4S37						10%
C46	470	1000	CC5647		MD-471				10%
C47	.1	400	CO-H-4104	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C48	.0047	600	CO-H-6472K	P688N-0047	D6-472	CUB6D47	GEM-6347	6TM-D47	
C49	.3900		CC5466	1464-0039		IR5D39		MS-339	10%
C50	.001	600	CO-O-6102K						10%
C51	680		RCM20A681K	1469-00068	MD-681	IR5T68		MS-368	10%
C52	.001	600	CO-O-6102K						10%
C53	110-580		CT3526						
C54	.047	400	CO-H-4473	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C55	100	3000	CC8781						10%
C56	68	3000	CC4530						10%
C57	10000		CCD103M	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	③
C58	.1	400	CO-H-4104	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C59	.047	600	CO-H-6473	P688N-047	DF-503	CUB6S47	GEM-6147	6TM-S47	

① Not used in some versions.
② Some versions may use 5000mmf in this application (Part #CCD502K).
③ Some versions may use 1000mmf in this application (Part #CCD102M).

CONTROLS

ITEM No	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	OLYMPIC PART No	CENTRALAB PART No	CLAROSTAT PART No	IRC PART No	MALLORY PART No	
R1A	150Ω	½	PT25405 ①	F1-7	RTV-670		■ (UE3538	Contrast
B	1meg	½		R2-52	Not Req.			Volume
C	Switch			KB-1 or KR-1*	Not Req.			
R2A	1meg	½	PT5704 ①	F1-51	RTV-669		■■ (UE3593	Horiz. Hold
B	2meg	½		R2-67	Not Req.	♦ QJ-956		Vert. Hold
R3A	1meg	½	PT5702 ①	B-69	A47-1meg-S	QJ1-137	U54	Brightness
B	Shaft			Not Req.	R5-2	Not Req.	Not Req.	
R4A	5000Ω	½	PT3619-2 ①	AB-10	B47-5000-S	QJ1-114	PTA53L	Vert. Lin.
B	Shaft			AK-1	Not Req.	TQ	Not Req.	
R5A	2.5meg	½	PT5008-1 ①	AB-53	B47-2.5meg-S	QJ1-239	TA255L	Height
B	Shaft			AK-1	Not Req.	TQ	Not Req.	

* Use KB with CRL "blue label" controls and KR with "red label "controls.
■ "STA-LOC" Equivalent : FA181L, CB1500, RU18A, RU22S, U54L.
♦ "Concentrikit" Equivalent : K-6 Kit, Base Elements & Shafts Bil-137, P17-118 (Panel) (Not Available as a factory assembled control.) Bil-139, R1-130 (Rear)
■■ "STA-LOC" Equivalent: FA181L, CB1500, RU18L, RU22S.
① Part numbers with prefix PT and PTK are interchangeable.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		OLYMPIC PART No.	NOTES
	OHMS	WATT		
R6	680Ω	1		
R7	330Ω		REB331M	
R8	82Ω			
R9	18K		REB183K-1	
R10	1meg		REB105K	
R11	1meg		REB105K	
R12	1.5meg		REB155K	
R13	12K		REB123K	
R14	6800Ω	4	RE5633	
R15	33K	2	RED333M	
R16	47Ω		REB470K	
R17	1500Ω		REB152M	
R18	150K		REB154K	
R19	22K		REB223K	
R20	100K		REB104K-A	
R21	100K		REB104K-A	
R22	1meg		REB105K	
R23	22K	1	REC223K	
R24	47K		REB473K	
R25	270K	1		
R26	330K		REB334K-A	
R27	560K		REB564K	
R28	560Ω		REB561K	
R29	1meg		REB105K	
R30	1meg		REB105K	
R31	700Ω	10	RE3959	
R32	22K		REB223K	
R33	470K		REB474K	
R34	2.2meg		REB225M	
R35	330K		REB334K-A	
R36	68K			Note 1
R37	68K			
R38	100K		REB104K-A	
R39	560K		REB564K	
R40	82K		REB823K	
R41	1.5meg		REB155K	
R42	1.5meg		REB155K	

ITEM No.	RATING		OLYMPIC PART No.	NOTES
	OHMS	WATT		
R43	10meg			
R44	150K		REB154K	
R45	12K		REB123K	
R46	560Ω		REB561K	
R47	1meg		REB105K	Note 2
R48	1.5meg		REB155K	
R49	1000Ω	2	RED102M	
R50	2700Ω		REB272K	
R51	560Ω		REB561K	
R52	560Ω		REB561K	
R53	560K		REB564K	
R54	680K			Note 3
R55	100K		REB104K-A	
R56	330K	1	REC334K	
R57	330K	1	REC334K	
R58	1meg		REB105K	
R59	82K		REB823K	
R60	82K		REB223K	
R61	10K		REB103K	
R62	820Ω		REB821K	Note 4
R63	1meg		REB105K	
R64	220K		REB224K	
R65	56K		REB563K	Note 5
R66	82K		REB823K	
R67	12K		REB123K	
R68	470K		REB474K	
R69	47Ω		REB470K	Note 6
R70	5600Ω	2	RED562K	
R71	3300Ω	2	RED332K	
R72	4700Ω		REB472K	
R73	47K	1	REC473M	
R74	3.3Ω	1	RE4419	
R75	100K	1	REB104K-A	
R76	470Ω		REB471K	
R77	330Ω		REB331M	
R78	330Ω		REB331M	

Note 1. Some versions may use 15K in this application (Part #REB153K-1).
Note 2. Some versions may use 1.5meg in this application (Part #REC155K-1).
Note 3. Some versions may use 820K in this application (Part #REB824K).
Note 4. Some versions may use 4000Ω in this application (Part #REB02M).
Note 5. Some versions may use 68K in this application.
Note 6. Some versions may use 39Ω in this application.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		OLYMPIC PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No	
L1	RF Choke	CLL535	19-3036	TV-180	6176	VP-1	35 Microhenries
L2	1st. Video IF	CL4753	17-4534	TV-131		VF-4	
L3	2nd. Video IF	CL2670					
L4	Resonant Choke	CK4225					1. 7 Microhenries
L5	Series Peaking Coil	CLI358	19-3180 *	TV-184 *	6180 *	VP-5 *	180 Microhenries, wound on 12K resistor
L6	Shunt Peaking Coil	CL2614	19-3500	TV-203	6174	VP-8	500 Microhenries
L7	Series Peaking	CL3403	19-3300 ▲	TV-199 ▲	6155 ▲		300 Microhenries, wound on 1meg resistor ①
L8	Shunt Peaking Coil	CL2614	19-3500	TV-203	6174	VP-8	500 Microhenries
L9	1st. Sound IF	CL2551S					Includes Cap. ②
L10	2nd. Sound IF	CL4021	17-3412				
L11	Quadrature Coil	CL3606-1			1481	SD-5	Includes Cap. ③
L12	Resonant Choke	CK4415					6.8 Microhenries

* Parallel with 12K resistor.
▲ Parallel with 1meg resistor.
① Alternate Part #CL5827.
② Alternate Part #CL5706.
③ Alternate Part #CL3603-1.

TRANSFORMER (HORIZ. OSC.)

ITEM No.	DC RES.		REPLACEMENT DATA						NOTES
	PRI.	SEC.	OLYMPIC PART No.	Meissner PART No	Merit PART No	Miller PART No.	Ram PART No.	Thordarson PART No	
L13	53Ω		CLS484-1						

FILTER CHOKE

ITEM No.	RATINGS		REPLACEMENT DATA						
	CURRENT (Measured)	DC RES.	INDUCTANCE (0 CURRENT 1000 ~)	OLYMPIC PART No.	Halldorson PART No.	Merit PART No	Ram PART No	Stancor PART No.	Thordarson PART No	Triad PART No
L14	200A	56Ω	.6 Hy.	CK4047	C5037 ①	C-2996 ①		C-2326 ②	26C44 ②	C-34X ②

① Drill new mounting hole.

TRANSFORMER (POWER)

ITEM No.	RATING		REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	OLYMPIC PART No	Halldorson PART No.	Merit PART No	Ram PART No	Stancor PART No	Thordarson PART No.	Triad PART No
T1	117V @1.4A	540VCT @ .200A	5V @3A	TR4007-2				P-8172		R-89BO①
	SEC. 3	SEC. 4	SEC. 5							
	6.3VAC @8A									

① Drill new mounting hole.

TRANSFORMERS (SWEEP CIRCUITS)

ITEM No	USE	REPLACEMENT DATA							NOTES
		OLYMPIC PART No	Halldorson PART No.	Merit PART No	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No	
T2	Vert. Output	TR-3689-D	Z1900 ①	A-3039 ②③	V312 ②③	A-8141 ②③	26S75 ①	A-109X ④	
T3 A	Yoke-Horiz. (15.4MH)	CL-3600-4	DF-807 ④⑤	MDF-92 ④⑤	Y90F19/43 ④⑤	DY-16A ④⑤	Y-16 ④③	Y-41 ⑥	
B	(90°)-Vert. (39MH)							NW3 ⑤	
	Rear Cover & Centering Device	PP5640						YC-1 ⑥	
	Yoke Clamp	SP5672						CL-1	
T4	Horiz. Output	TR-3599-5			X151 *			D-120 *	

① Use 18 : 1 turns ratio.
② Drill new mounting hole(s).
③ Remove pin #1 of yoke socket from ground. Connect red lead to junction of C4, R5, R49 and pin #7 of yoke socket. Connect green lead to pin #4 of yoke socket.
④ Use original horizontal damping network, if necessary.
⑤ Connect same as original.

*HORIZONTAL OUTPUT TRANSFORMER CONNECTION DATA

Use Original Width Coil Unless Replacement Type Is Listed

ORIGINAL TERMINAL CONNECTIONS	Halldorson Replacement Connections	Merit Replacement Connections	Ram Replacement Connections	Stancor Replacement Connections	Thordarson Replacement Connections	Triad Replacement Connections
9			9			9
8			8			8
6			6			6
3			4			3
2			3 & 2			2
1			1			1

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA						NOTES
	PRI.	SEC.	OLYMPIC PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T5	2400Ω	3-4Ω	TR3766-1	Z1101	A-3025	AU-605	A-3332	24S53	S-12X	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	OLYMPIC PART No.	QUAM PART No	
SP1	4"	PM	3-4Ω	SK4342 ①	4A07	① Alternate Part #SK3563.

RECTIFIERS

ITEM No.	RATING	REPLACEMENT DATA					NOTES
	CURRENT (Measured)	OLYMPIC PART No.	FEDERAL PART No.	GENERAL ELECTRIC PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1		RF5465	K1616 ①	SD-91 ②			① Selenium Type. ② Silicon Type.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			OLYMPIC PART No.		LITTELFUSE PART No.		BUSS PART No	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	C	3/8A 250V	FU4345	FH4344	332 375 (C 3/8A-250V)	346002	C 3/8	HC 3/10 to 1/2

OLYMPIC MODELS TY103, TY103U (Ch. GY, GYU)

FOLDER 3

PARTS LIST AND DESCRIPTIONS (Continued)

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		OLYMPIC PART No.	CBS PART No.	SYLVANIA PART No.	
M3	1N64	1N64 *	1N64	1N295	Video Detector (Pigtail) * Some versions may use a 1N60 in this application.

MISCELLANEOUS

ITEM No.	PART NAME	OLYMPIC PART No.	NOTES
M4	Tuner	CL5659	VHF, Ch. GY
	Tuner	CL5662	VHF, With UHF Provisions , Ch. GYU
	Tuner	CL5825	UHF, Ch. GYU
M5	Switch	SW2966-1	Distant-Local (DPDT, Slide Type)

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Safety Glass	PP3656	
Mask	PP3646-1	
Knob	KN5895	Channel Selector
Knob	KN5896	Fine Tuning
Knob	KN5854-2	Brightness
Knob	KN5852-3	Contrast, Brightness, Horiz. Hold
Knob	KN5853-2	Vert., On-Off - Volume
Cabinet	CA25627	

WIRING DATA

High Voltage Lead	Use BELDEN No.	8869
Shielded Hook-up Wire	Use BELDEN No.	8885 (Single Conductor) 8738 (Two Conductor)
General-use Unshielded Hook-up Wire	Use BELDEN No.	8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord (Interlock Type)	Use BELDEN No.	8874
300Ω Tuner Input Lead	Use BELDEN No.	8225
300Ω Antenna Lead-in	Use BELDEN No.	8230 or 8275
Antenna Rotor Cable	Use BELDEN No.	8464 (Flat) or 8484 (Round) - 4 Conductor 8485 (Round) - 5 Conductor 8488 (Round) - 8 Conductor

TUNER CL 5659
PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V201	RF Amp.	6CY5	

ITEM No.	USE	TYPE	NOTES
V202	Mixer-Osc.	6AT8A	

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	OLYMPIC PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C201	100								N2200
C202	22			N750-DI 22	DTN-22	C10Q22U		5TCU-Q22	N750
C203									
C204									
C205									
C206	2					C10V2C			
C207	18				TCZ-18	C10Q18C			NPO
C208									
C209									
C210									
C211	1.2								
C212	10			BPD-00001	DD-100	L10Q1	UC-541	5GA-Q1	
C213	6.8			NPO-DI 6.8	DTZ-6R8	C10V68C	ZT-5568	5TCCB-V68	
C214									
C215	1.5								N330
C216									
C217	800			BPD-0008	DD-801	L10T8		5TA-T8	
C218									
C219	100			BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C220	56	2000							10%

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		OLYMPIC PART No.	NOTES
	OHMS	WATT		
R201	10K			
R202	18K			
R203	47K			
R204	4700Ω			

ITEM No.	RATING		OLYMPIC PART No.	NOTES
	OHMS	WATT		
R205	100K			
R206	1800Ω			
R207	15K			
R208	4700Ω			

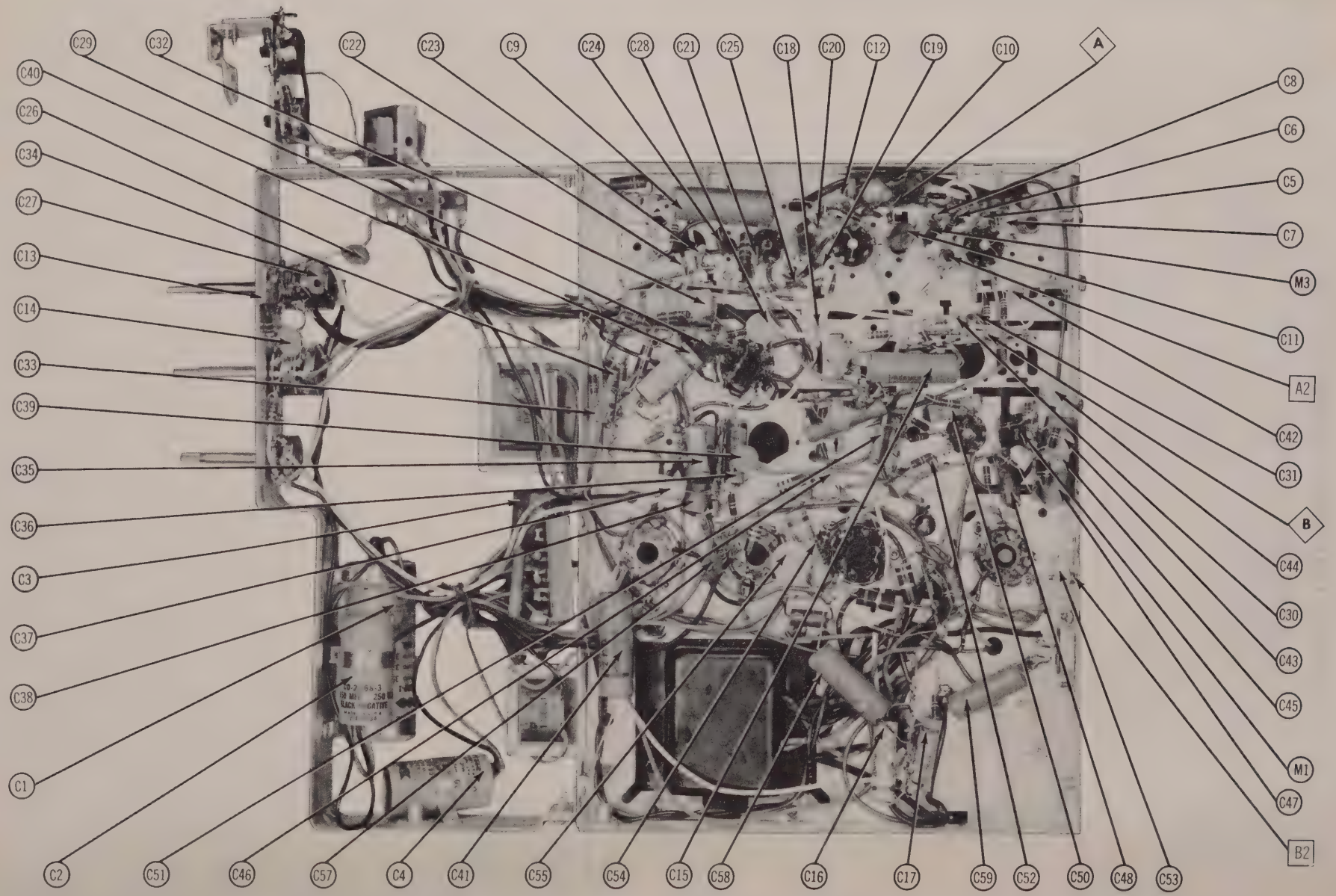
ALIGNMENT INSTRUCTIONS

VHF OSCILLATOR ALIGNMENT

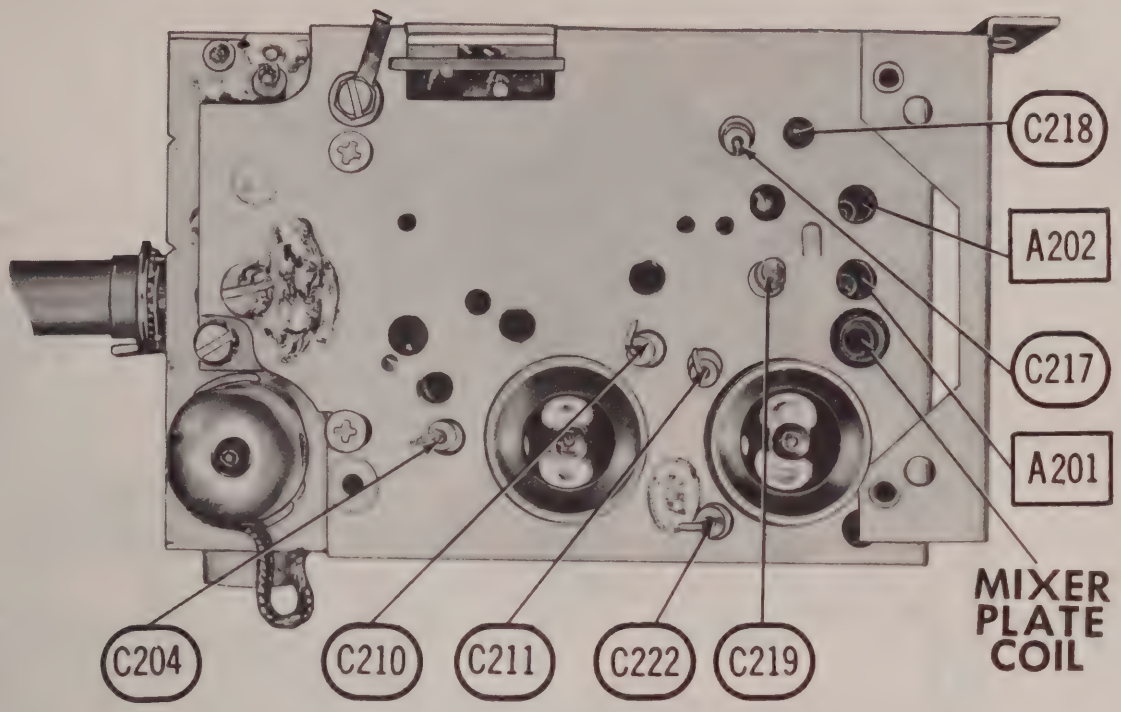
Channel 13 oscillator adjustment slug (A201) is also used for adjusting the other high band (12 thru 7) channels. Channel 6 oscillator adjustment slug (A202) is also adjusted for channel 5. Channel 4 oscillator adjustment (A203) is also adjusted for channel 3. Channel 2 oscillator slug (A204) is used for channel 2 only.

Turn the set on and tune in the highest high band channel and adjust controls for normal operation. Set Fine Tuning to the center of its range. Adjust A201 for best picture and sound. Switch to next high band channel. If necessary to adjust, do so by bending coil loop appearing at the hole to left of tuner shaft for best picture and sound.

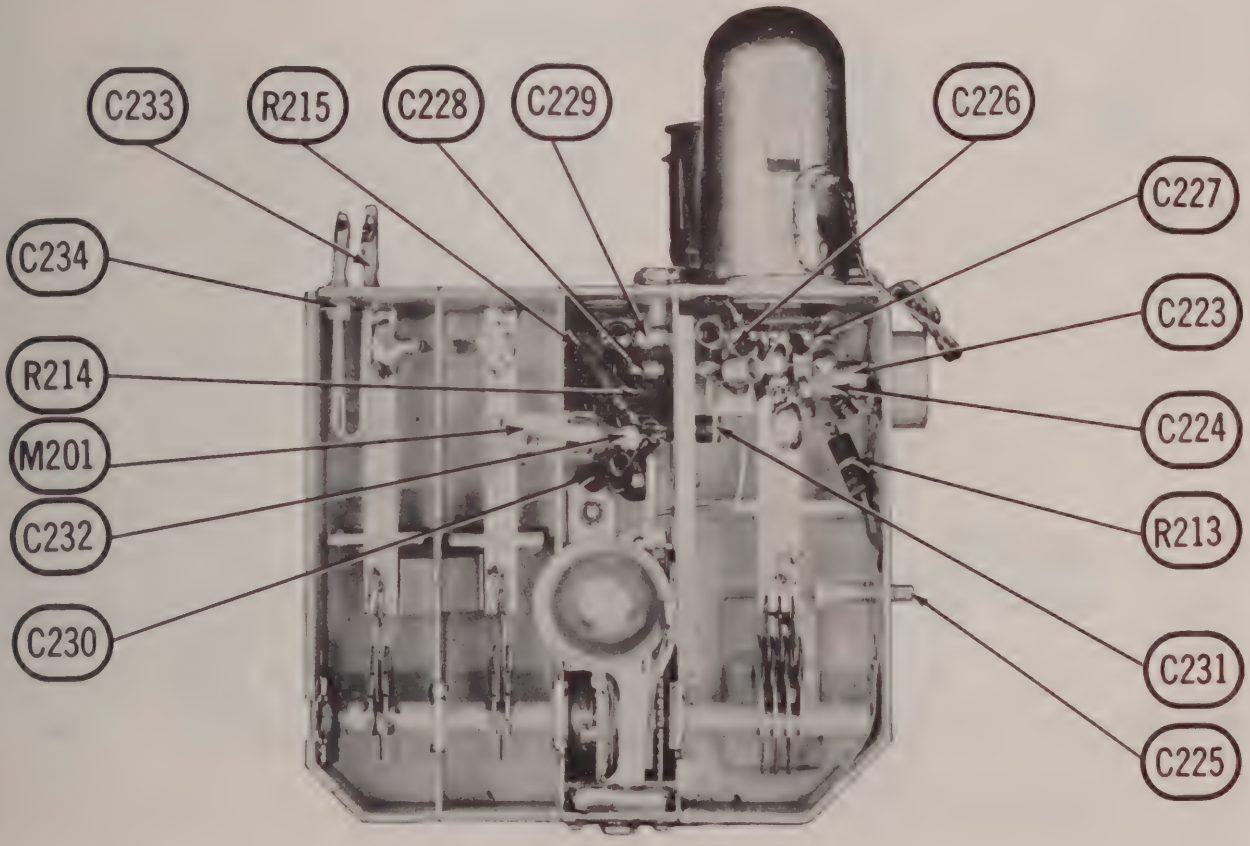
Switch Channel Selector to the highest low band channel (6 thru 2) operating in the area. Adjust proper slug for best picture and sound. If channel 5 or 3 need adjusting, it will be necessary to switch to the next higher channel, adjust slug SLIGHTLY, then switch back to the channel needing adjustment and check picture. Repeat until proper results are obtained. Repeat procedure until all channels operating in the area have been properly adjusted.



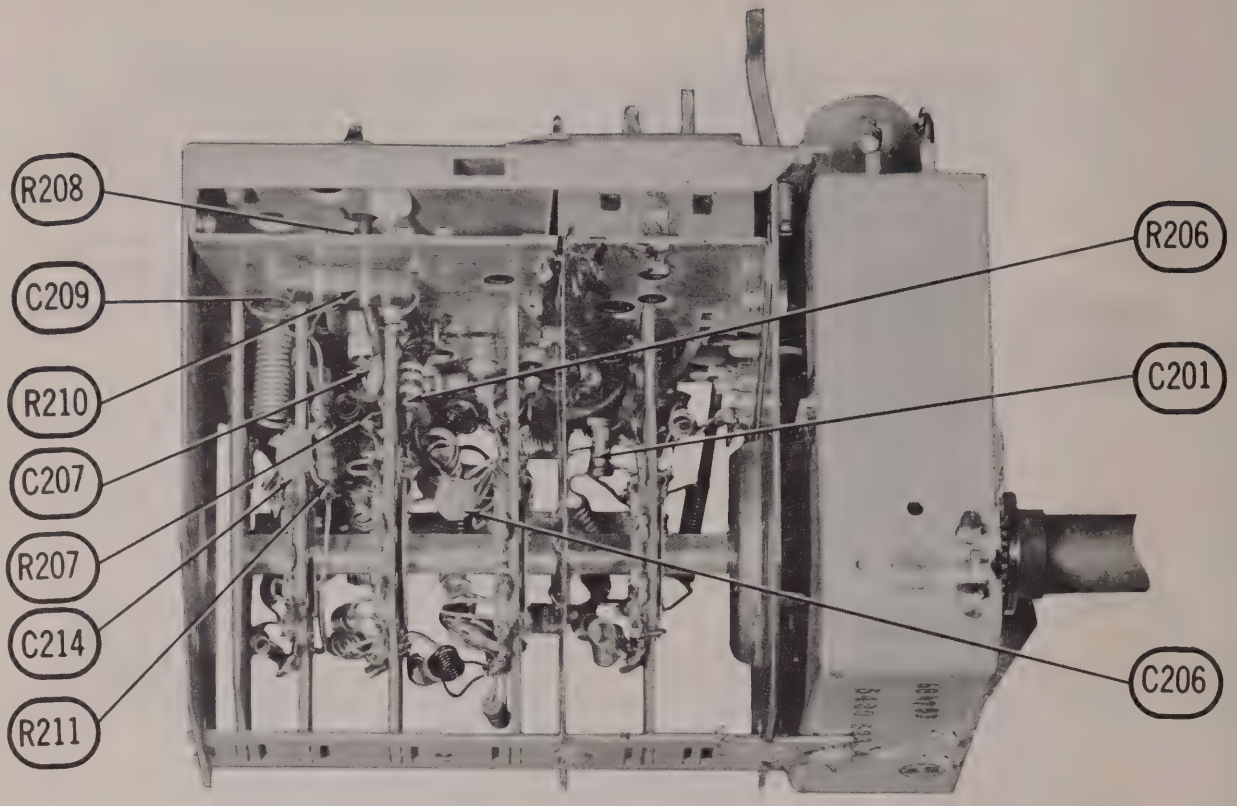
CHASSIS BOTTOM VIEW-CAPACITOR AND ALIGNMENT IDENTIFICATION



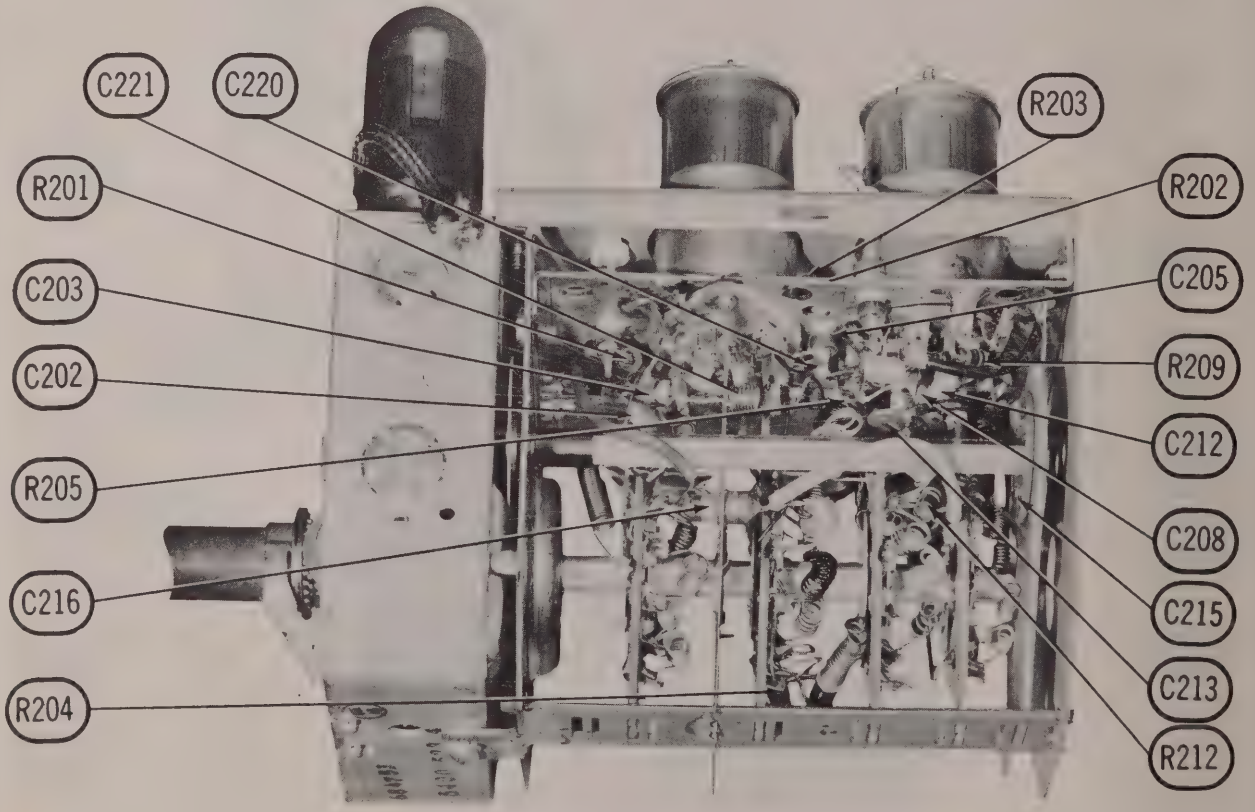
TUNER #CL5662 - TOP VIEW



TUNER #CL5825 - END VIEW



TUNER #CL5662 - LEFT SIDE

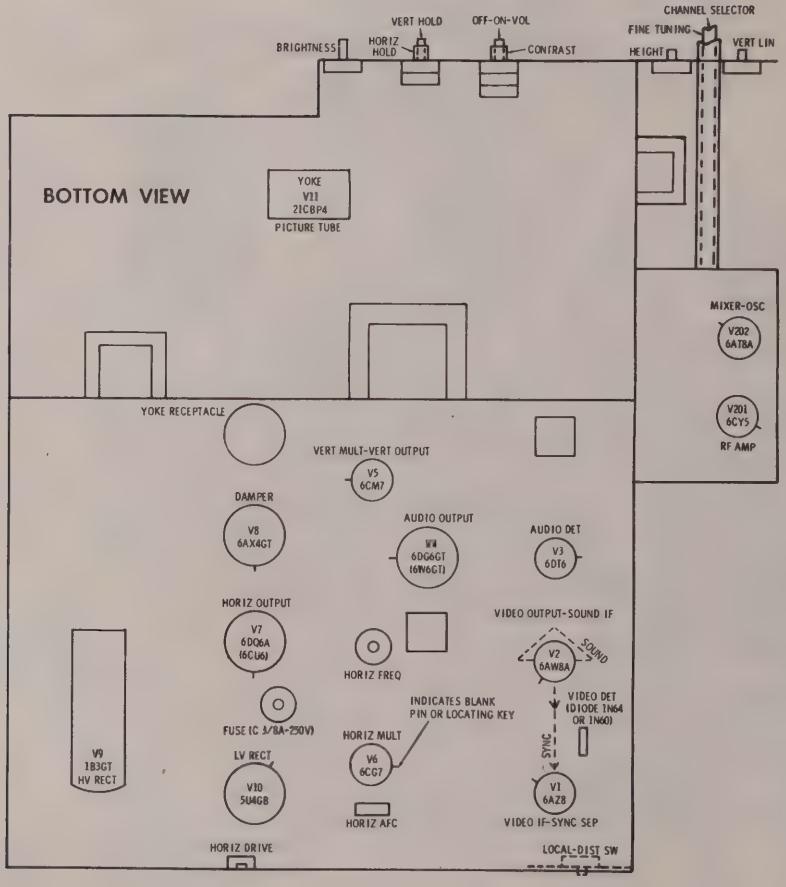


TUNER #CL5662 - RIGHT SIDE

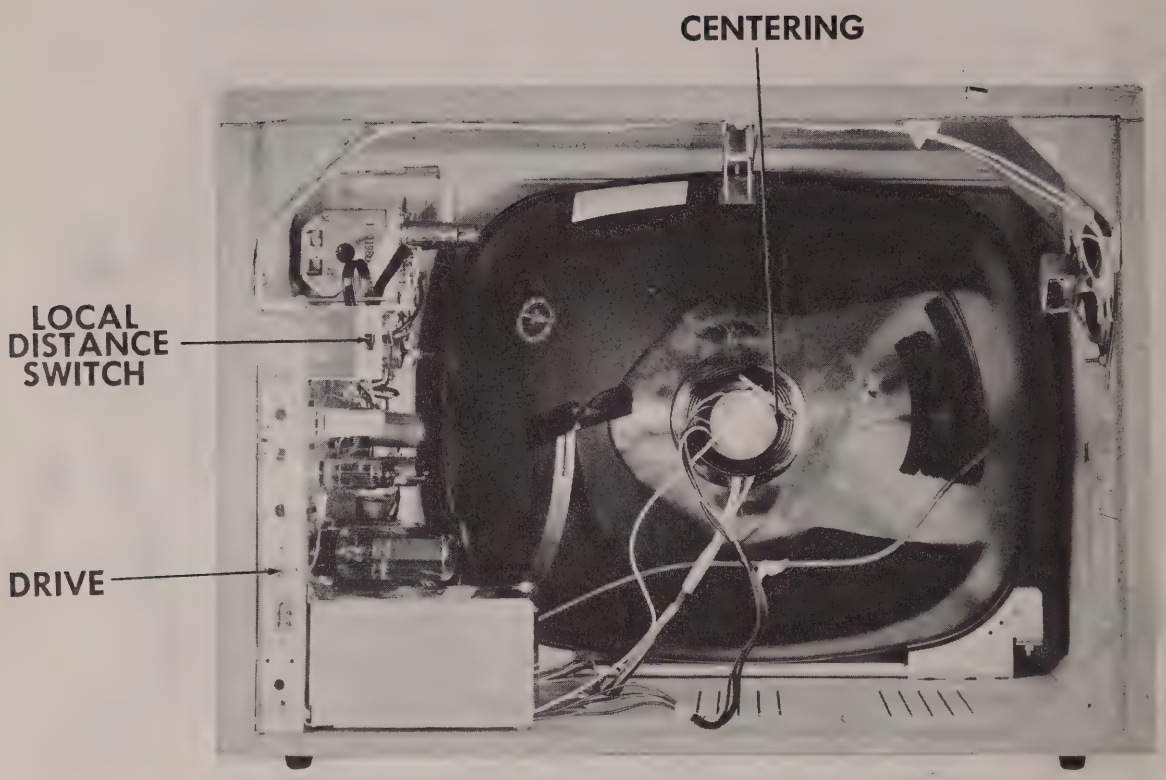
RESISTANCE MEASUREMENTS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6AZ8	■ 330Ω	■ 330Ω	82Ω	.1Ω	0Ω	2.4Ω	0Ω	† 330K	2.2meg
V2	6AW8A	0Ω	1meg	■ 22K	.1Ω	0Ω	● 700Ω	550K	† 33K	† 6800Ω
V3	6DT6	2.7Ω	560Ω	.1Ω	0Ω	† 270K	■ 0Ω	560K		
V4	6DG6GT	0Ω	0Ω	† 875Ω	† 700Ω	500K	TP	.1Ω	¶	
V5	6CM7	‡ 2200Ω	NC	0Ω	0Ω	.1Ω	● ‡ 1.4meg	● 900K	1.5meg	● 2400Ω
V6	6CG7	† 6200Ω	1.6meg	820Ω	.1Ω	0Ω	† 82K	50K	820Ω	0Ω
V7	6DQ6A	0Ω	0Ω	NC	† 8900Ω	470K	TP	.1Ω	0Ω	TOP CAP † 20Ω
V8	6AX4GT	NC	NC	¶ 160K	NC	† 0Ω	NC	0Ω	.1Ω	
V9	1B3GT	PINS 1 THRU 8 HAVE INFINITE RESISTANCE								TOP CAP ‡ 540Ω
V10	5U4GB	NC	¶	NC	32Ω	NC	30Ω	TP	¶	
V11	21CBP4	0Ω	22K	Pin 6 ‡ 50K	Pin 10 ‡ 50K	Pin 11 ● 350K	Pin 12 .1Ω			
V201	6CY5	1meg	0Ω	0Ω	.1Ω	■ 0Ω	■ 18K	0Ω		
V202	6AT8A	15K	■ 4700Ω	0Ω	0Ω	.1Ω	■ 1800Ω	■ 0Ω	0Ω	100K
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
● THIS READING WILL VARY. CONTROL SET FOR NORMAL OPERATION.
† MEASURED FROM 275V SOURCE.
‡ MEASURED FROM PIN 3 OF V8.
■ MEASURED FROM 130V SOURCE.
NC NO CONNECTION
TP TIE POINT



TUBE PLACEMENT CHART



CABINET—REAR VIEW

HORIZONTAL SWEEP CIRCUIT ADJUSTMENTS

Turn the set on and allow it to warm up for 2 minutes.

Tune in a TV station, preferably with a test pattern.

Connect a clip lead from point Ⓑ to chassis. Connect another clip lead across the Horizontal Frequency coil (L13).

Adjust the Horizontal Hold until the picture synchronizes horizontally. (It may float back and forth.)

Remove the clip lead from L13. Adjust the Horizontal Frequency slug (B1) until the picture is again in frequency. Remove clip lead from point Ⓑ and chassis.

Turn Horizontal Drive Trimmer (B2) counterclockwise until a vertical white line (drive line) appears near the center of the screen, then turn clockwise until line just disappears. If drive line cannot be obtained, adjust B2 for proper width.

If B2 is adjusted, recheck adjustment of B1 and Horizontal Hold.

The PHOTOFACT Servicer

SET 416 ★ *Published for all users of Howard W. Sams' Photofact Folders* ★ OCT 1, 1958

CONTENTS PHOTOFACT SET 416

TRADE NAME AND MODEL	SET AND FOLDER NO.
TELEVISION RECEIVERS	
EMERSON	
1414, 1415, 1432, 1433, 1434, 1435, 1438, 1439, 1440, 1441 (Ch. 120397B, 120407S, 120408U, 120417S, 120418U, 120419B, 120420S, 120421U, 120422S, 120423U)	416-1
GENERAL ELECTRIC	
17T2405, 17T2410, 17T2411, 17T2412, 21C2440, 21C2441, 21C2445, 21C2446, 21T2419, 21T2420, 21T2421, 21T2425, 21T2426 & UHF (M4 Line)	416-2
OLYMPIC	
TY103, TY103U (Ch. GY, GYU)	416-3
OTHER EQUIPMENT	
ANDREA	
CRP-24WA, 2CR-P12WB (Ch. P12WB, RP24WA, RQ12T-1, -2)	416-4
EKOTAPE Tape Recorder	
270 Series, 280 Series	416-5
FIRESTONE	
4-A-176, 4-A-178 (Codes 1-7-4C3, 1-7-4T4)	416-6
HARMAN-KARDON	
4-12 (Prelude II)	416-7
MOPAR	
925 (P-5803)	416-8
MOTOROLA	
CTM8X, CTM57X, 398X	416-9
3F22C, E, R (Ch. HS-599)	416-10
PHONOLA	
657, 658	416-11
ZENITH	
HF1178RD, HF1185MD, RD, HF1284D, ED, LD, YD, HF1286RD (Ch. 11A20, 11A21)	416-12

MOTOROLA SERVICE HINTS

MOTOROLA CH. TS-425.....PHOTOFACT FOLDER 369-14

Indication: Service technician received "shock" from cabinet after installing new picture tube.

Trouble: The outer coating on the replacement tube covered a larger area than the original tube. The coating extended under the picture tube retaining brackets at the front of the set, causing a connection between the chassis and the cabinet.

Remedy: Remove the coating under and in the vicinity of the picture tube retaining brackets.

This situation points out one of the unusual ways that the cabinet of a receiver can become connected to the chassis.

A "shock hazard" check should be made on every set, before the set is permitted to leave the shop.

MOTOROLA CH. TS-542.....PHOTOFACT FOLDER 382-1

Indication: No raster, resistor R107 on yoke socket burned.

Trouble: Shorted high voltage transformer secondary coil.

Remedy: Replace R107, and high voltage secondary coil.

MOTOROLA CH. TS-544.....PHOTOFACT FOLDER 393-2

Indication: Intermittent video when channel selector knob is moved.

Trouble: Fine tuning capacitor plates touching.

Remedy: Move plates apart and secure wafer in place with guide clip.

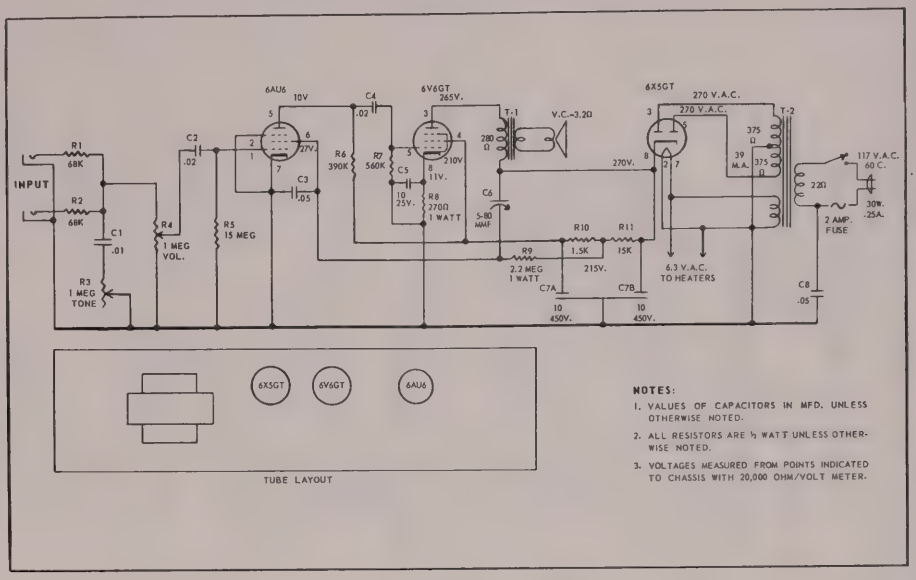
Indication: Remote control receiver works properly when on bench, but suffers loss of sensitivity when replaced in cabinet.

Trouble: Loose ferrite sleeve on input coil L38. Rotating the chassis for mounting caused the sleeve to move, which resulted in detuning of L38.

Remedy: Secure ferrite sleeve, or replace L38.

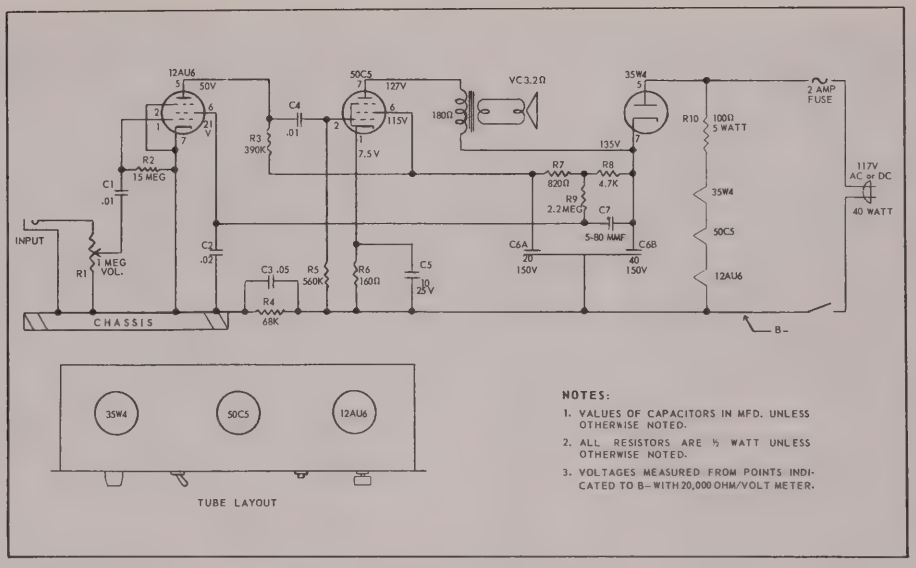
These service hints coutresy Motorola Inc.

SCHEMATIC DIAGRAMS COURTESY MONTGOMERY WARD & CO.



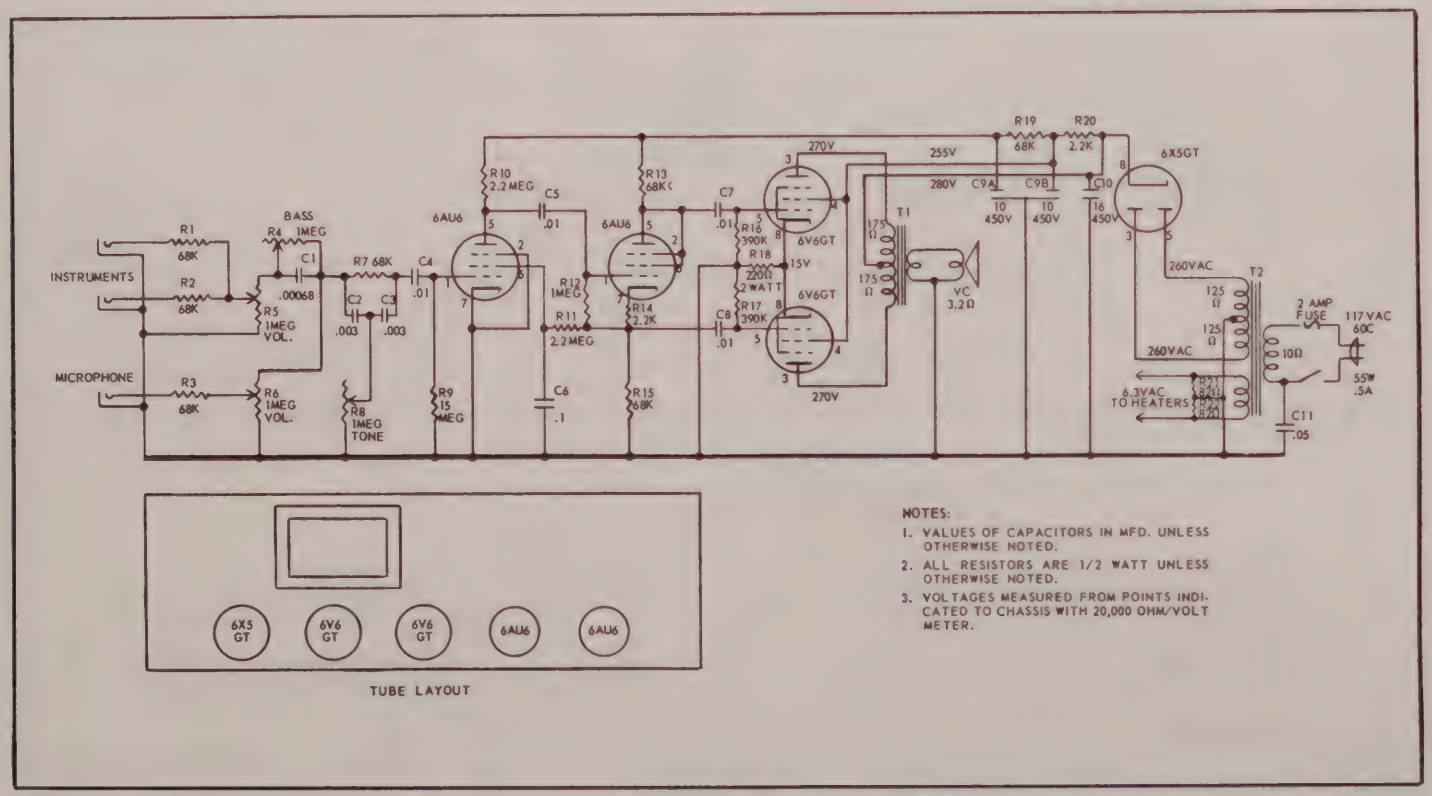
AIRLINE

MUSICAL INSTRUMENT AMPLIFIER MODEL GDR-8512A



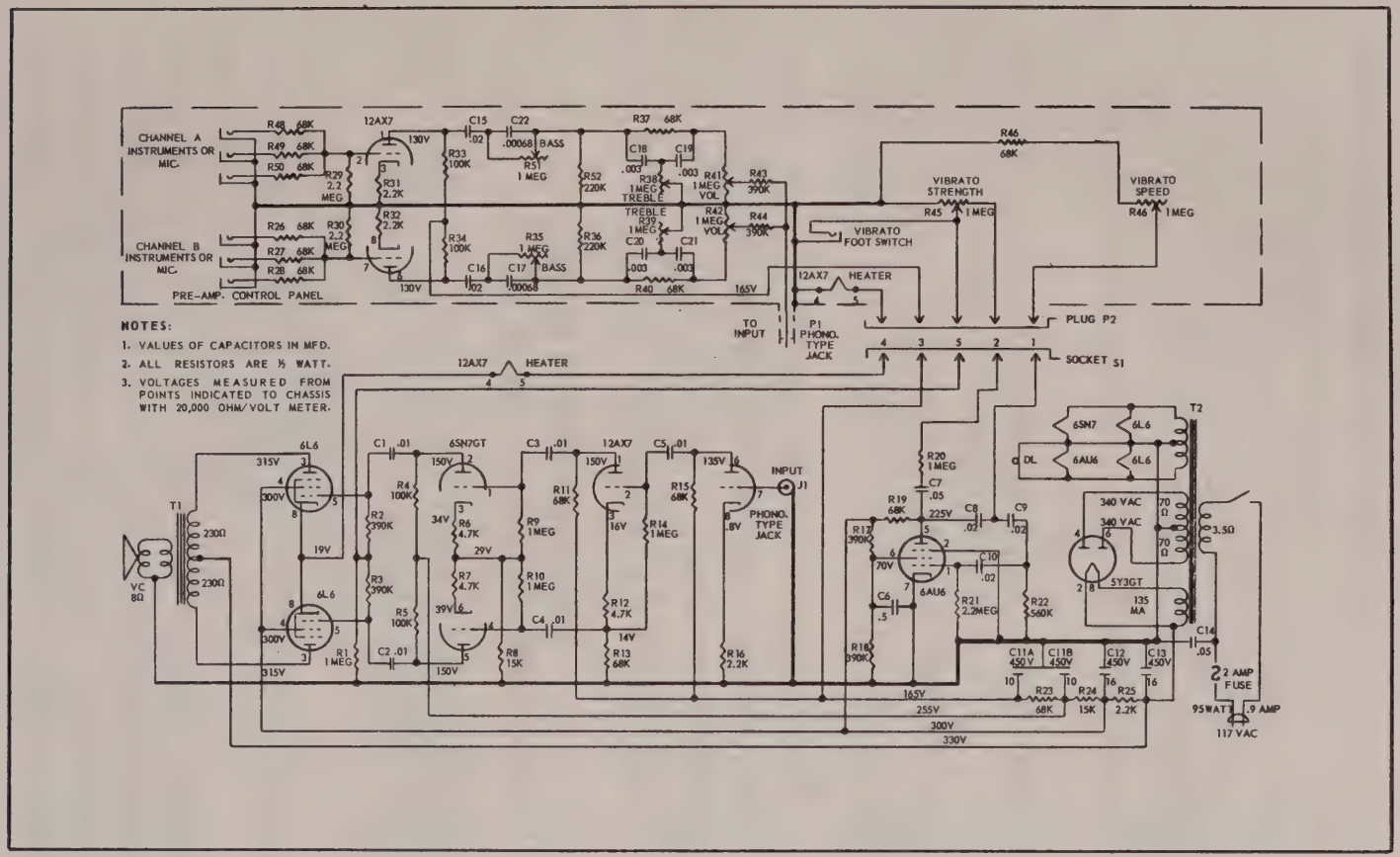
AIRLINE

MUSICAL INSTRUMENT AMPLIFIER MODEL GDR-8511A



AIRLINE
MUSICAL INSTRUMENT AMPLIFIER MODEL GDR-8513A

SCHEMATIC DIAGRAM COURTESY MONTGOMERY WARD & CO.



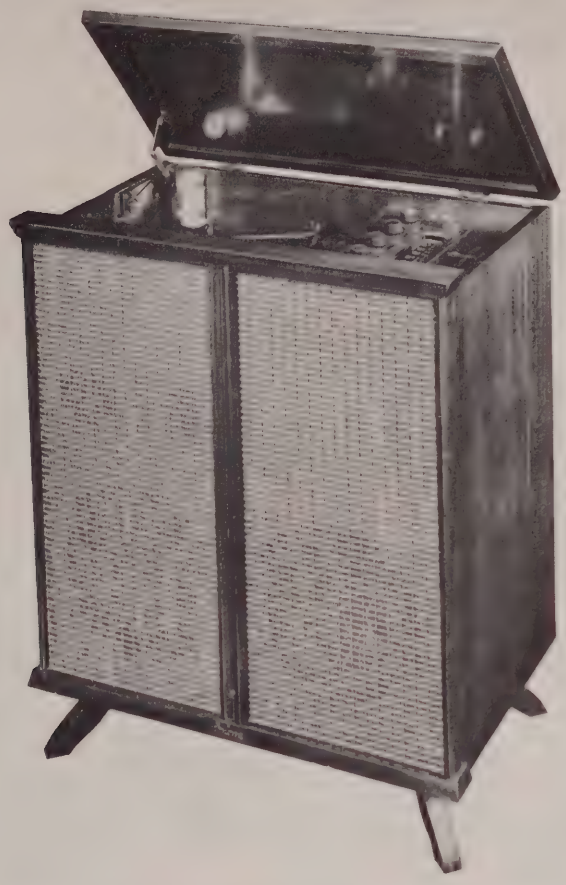
AIRLINE
MUSICAL INSTRUMENT AMPLIFIER MODEL GDR-8516A

SCHEMATIC DIAGRAM COURTESY MONTGOMERY WARD & CO.

PHOTOFACT* Folder

ANDREA MODELS CRP-24WA, 2CR-P12WB
(Ch. P12WB, RP24WA, RQ12T-1, -2)

ANDREA MODELS CRP-24WA, 2CR-P12WB
(Ch. P12WB, RP24WA, RQ12T-1, -2)

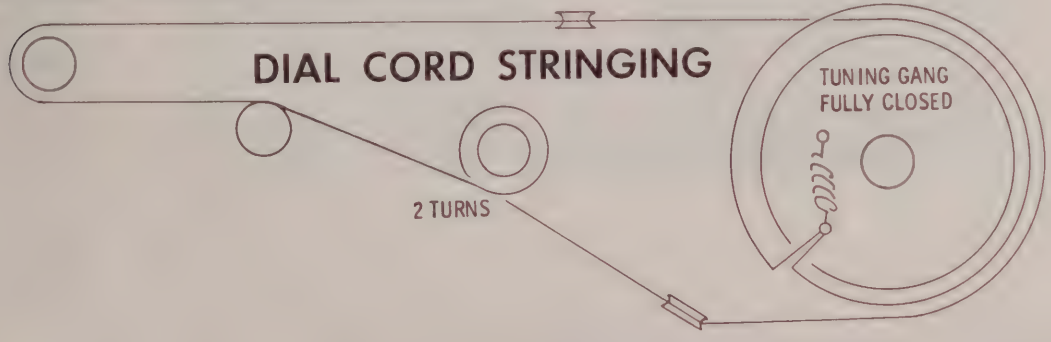


ANDREA MODELS CRP-24WA, 2CR-P12WB
(Ch. P12WB, RP24WA, RQ12T-1, -2)

TRADE NAME	Andrea	MODELS	CRP-24WA (Ch. RQ12T-1 Tuner, RP24WA Amp.) 2CR-P12WB (Ch. RQ12T-2 Tuner, P12WB Amp.)
MANUFACTURER	Andrea Radio Corp., 27-01 Bridge Plaza North, Long Island City 1, N. Y.		
TYPE SET	AC Operated FM-AM Tuner, Amplifier and 4 Speed Automatic Record Changer		
TUBES	RQ12T-1 : Twelve RQ12T-2 : Thirteen		RP24WA : Seven P12WB : Four
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATINGS	CRP-24WA: 1.38 Amp. @ 117 Volts AC (150 Watts) 2CR-P12WB : 1.06 Amp. @117 Volts AC (115 Watts)
TUNING RANGE - BROADCAST	540-1700KC	FREQ. MOD.	88-108MC

FOR SERVICE INFORMATION ON RECORD CHANGER - SEE SIMILAR GARRARD RC121/4 - PHOTOFACT SET 355 FOLDER 4 ON RECORD CHANGER MANUAL RC-10.

DIAL CORD STRINGING



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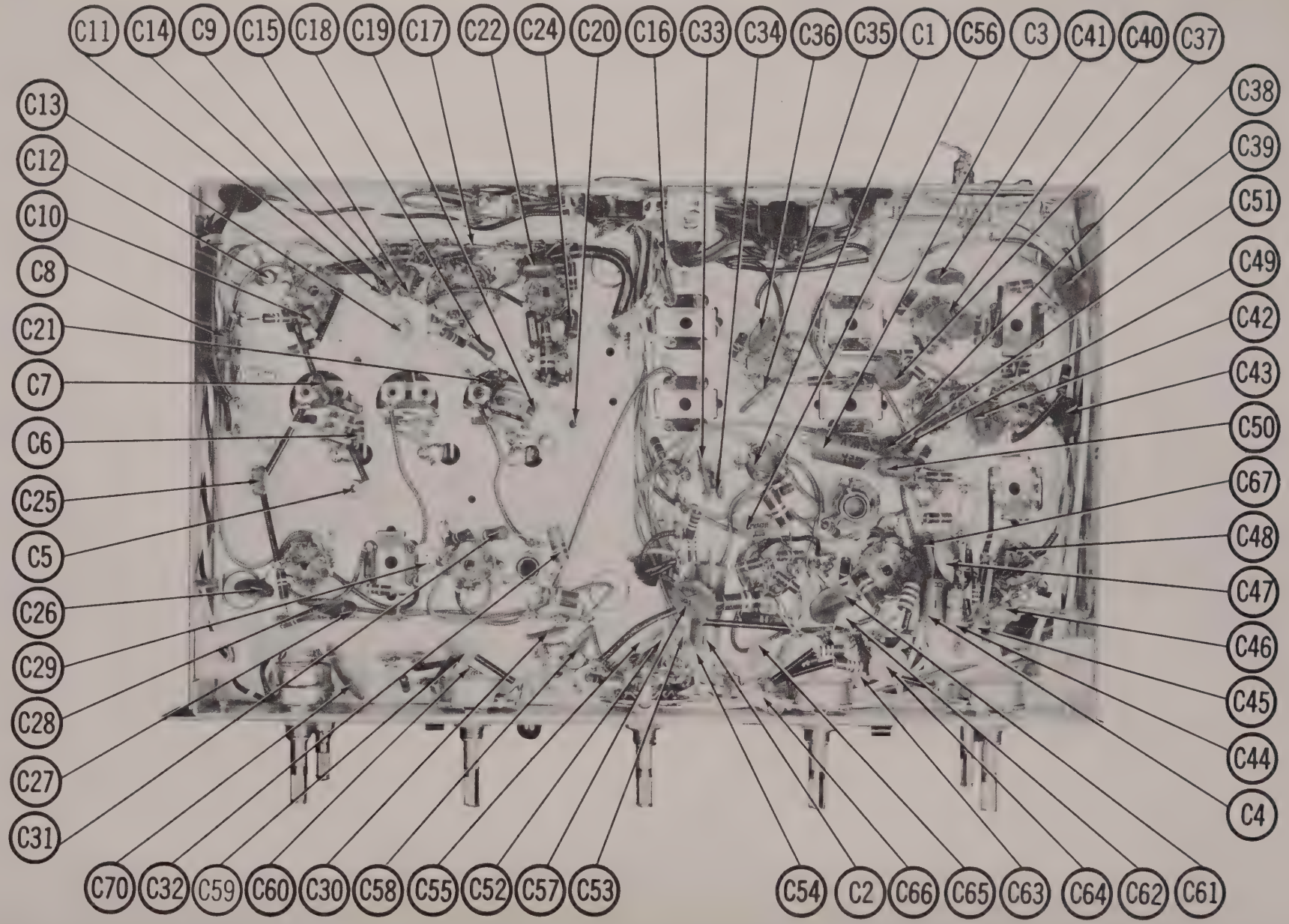
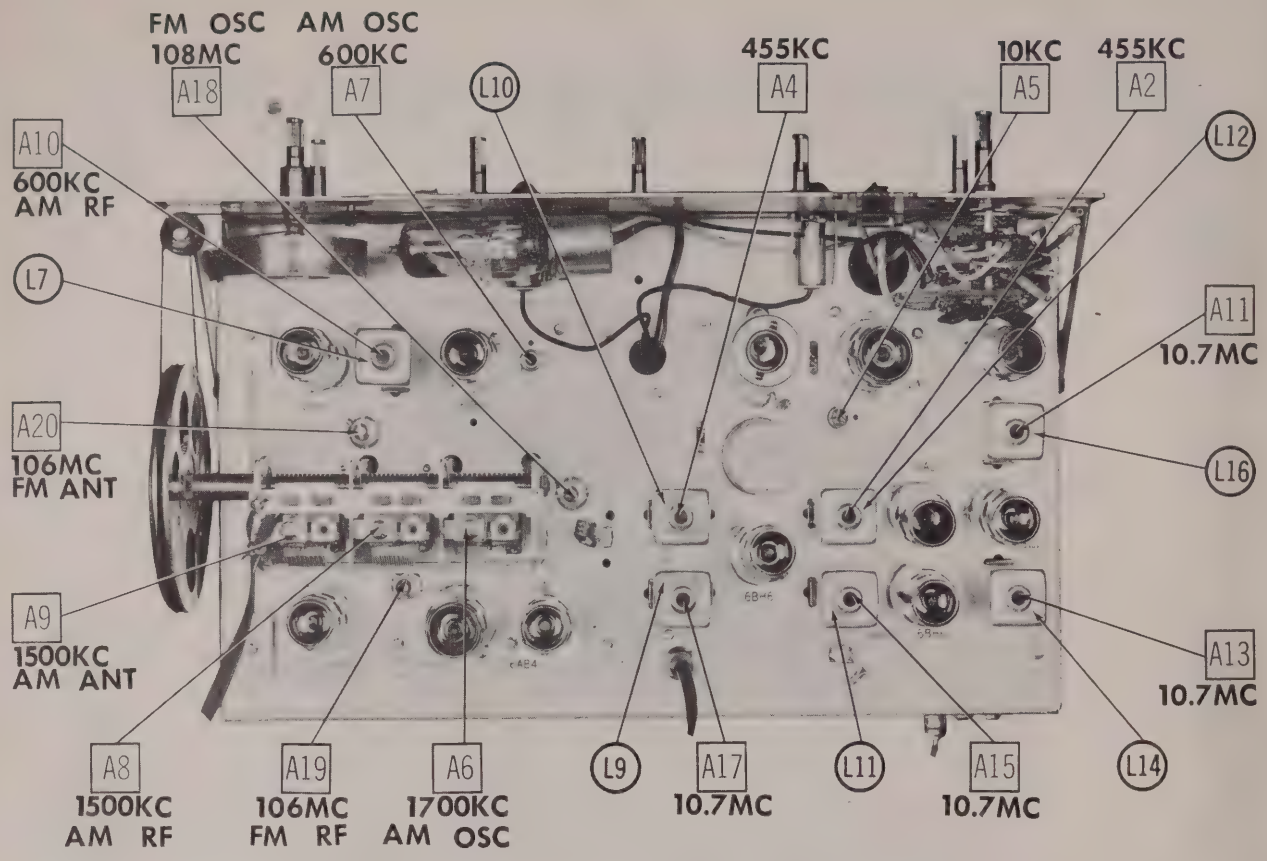
The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1958 Howard W. Sams & Co., Inc., Indianapolis 5, Indiana . Printed in U.S. of America



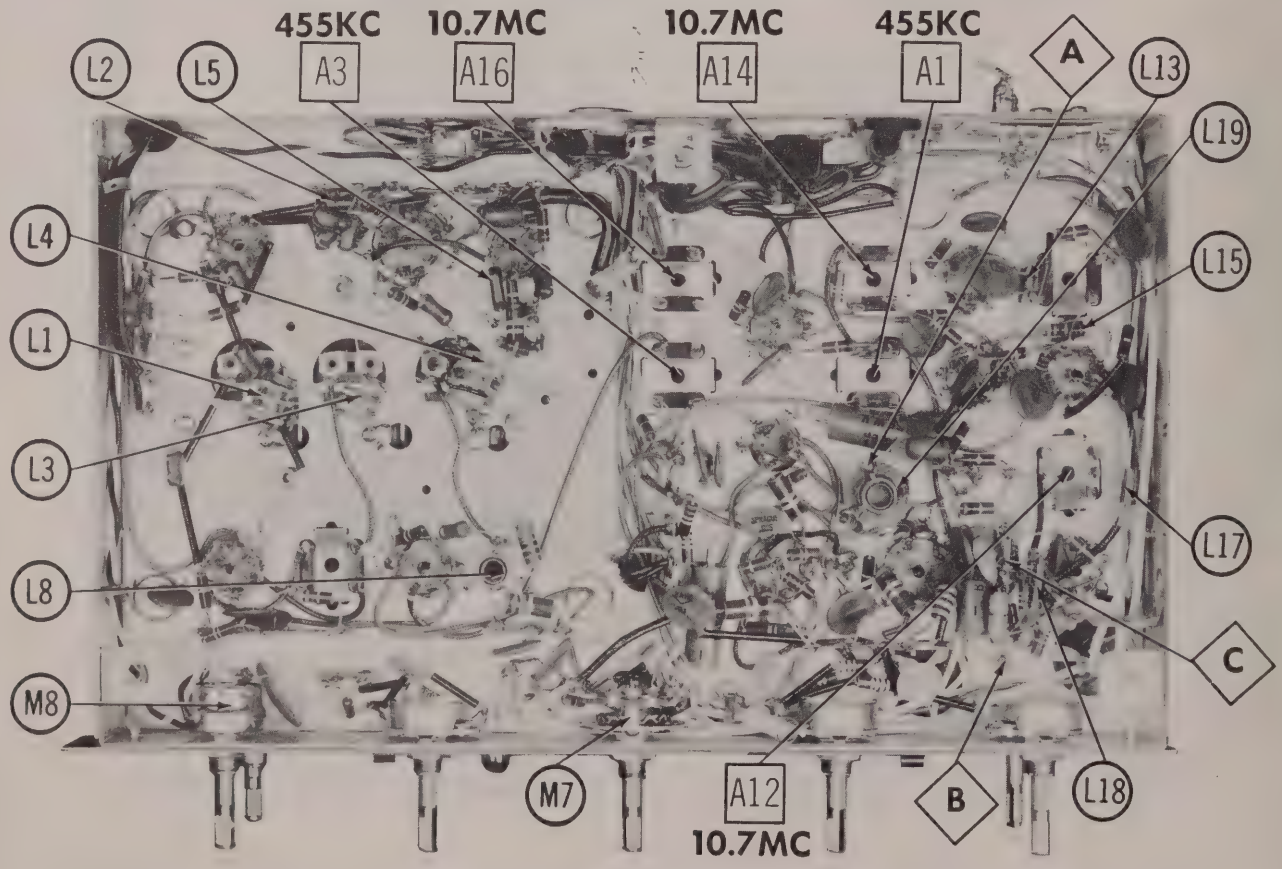
TUNER CHASSIS BOTTOM VIEW - CAPACITOR IDENT

TUNER CHASSIS BOTTOM VIEW - RESISTOR IDENT

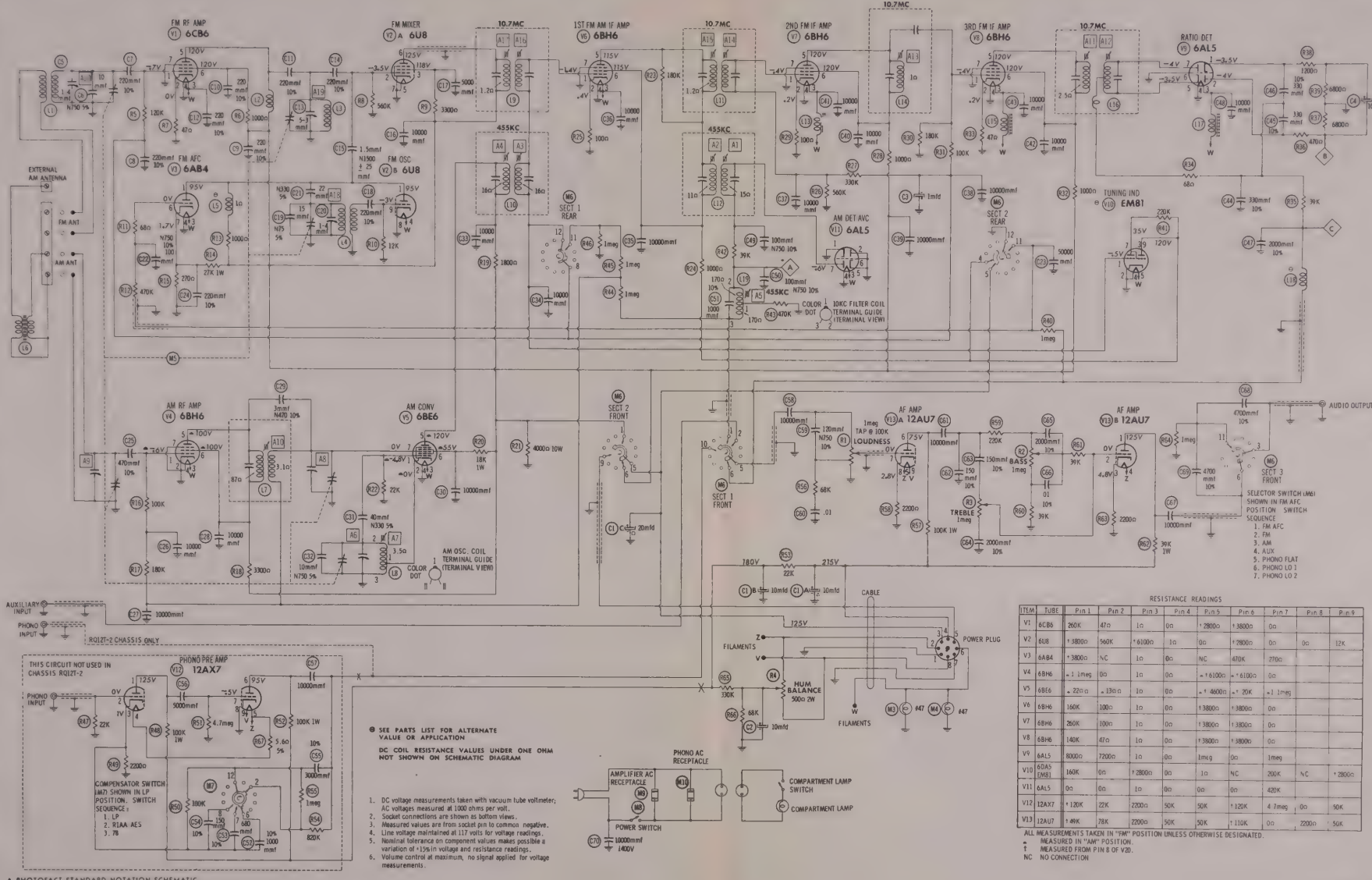
ANDREA
MODEL CRP-24WA (Ch. P12WB)



TUNER CHASSIS TOP VIEW - ALIGN & INDUCTOR IDENT



TUNER CHASSIS BOTTOM VIEW - ALIGN, INDUCTOR & MISC IDENT



● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6CB6	260K	47Ω	1Ω	0Ω	†2800Ω	†3800Ω	0Ω		
V2	6U8	†3800Ω	560K	†6100Ω	1Ω	0Ω	†2800Ω	0Ω	0Ω	12K
V3	6AB4	†3800Ω	NC	1Ω	0Ω	NC	470K	270Ω		
V4	6BH6	~1.1meg	0Ω	1Ω	0Ω	~†6100Ω	~†6100Ω	0Ω		
V5	6BE6	~220Ω	~130Ω	1Ω	0Ω	~†4600Ω	~† 20K	~1.1meg		
V6	6BH6	160K	100Ω	1Ω	0Ω	†3800Ω	†3800Ω	0Ω		
V7	6BH6	260K	100Ω	1Ω	0Ω	†3800Ω	†3800Ω	0Ω		
V8	6BH6	140K	47Ω	1Ω	0Ω	†3800Ω	†3800Ω	0Ω		
V9	6AL5	8000Ω	7200Ω	1Ω	0Ω	1meg	0Ω	1meg		
V10	6DA5 EM81	160K	0Ω	†2800Ω	0Ω	1Ω	NC	200K	NC	†2800Ω
V11	6AL5	0Ω	0Ω	1Ω	0Ω	0Ω	0Ω	420K		
V12	12AX7	†120K	22K	2200Ω	50K	50K	†120K	4.7meg	0Ω	50K
V13	12AU7	†49K	78K	2200Ω	50K	50K	†110K	0Ω	2200Ω	50K

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.
~ MEASURED IN "AM" POSITION.
† MEASURED FROM PIN 8 OF V2D.
NC NO CONNECTION

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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416-4

TUNER SCHEMATIC

TUNER PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	6CB6	
V2	FM Mixer-FM Osc.	6U8	
V3	FM AFC	6AB4	
V4	AM RF Amplifier	6BH6	
V5	AM Converter	6BE6	
V6	1st. FM-AM IF Amp.	6BH6	
V7	2nd. FM IF Amp.	6BH6	
V8	3rd. FM IF Amp.	6BH6	
V9	Ratio Detector	6AL5	
V10	Tuning Indicator	EM81	6DA5 ①
V11	AM Det.-AVC	6AL5	
V12	Phono Preamp.	12AX7	
V13	AF Amplifier	12AU7	

① Domestic type listed may not be directly interchangeable in some instances.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	ANDREA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲10	450	HCE-1356	AFH3-35	C0260	FP376.3	TMT-32	T-135	TVL-3779
B	10	450					TD-10-450		
C	■20	450							
C2	10	50	HCE-1357	PRS50V10	BBR10-50	TC75	TD-10-50	MT-0510	TVA-1304
C3	1	25	HCE-1358	SRE50V1	BBR1-50	TC31	TD-1-50	MMT-4501	TVA-1300
C4	10	50	HCE-1357	PRS50V10	BBR10-50	TC32	TD-10-50	MQ-0510	TVA-1304

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	ANDREA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C5	1-4		HCV-2130		829-4		CT551		
C6	10		HCC-1904	N750-SI 10	TCN-10			5TCU-Q1	N750 5%
C7	220		HCC-1966-1	NPO-SI 220	D6-221			5TCC-T22	10%
C8	220		HCC-1966-1	NPO-SI 220	D6-221			5TCC-T22	10%
C9	220		HCC-1966-1	NPO-SI 220	D6-221			5TCC-T22	10%
C10	220		HCC-1966-1	NPO-SI 220	D6-221			5TCC-T22	10%
C11	220		HCC-1966-1	NPO-SI 220	D6-221			5TCC-T22	10%
C12	220		HCC-1966-1	NPO-SI 220	D6-221			5TCC-T22	10%
C13	.5-3		HCV-2129		829-3		CT565A		
C14	220		HCC-1966-1	NPO-SI 220	D6-221			5TCC-T22	10%
C15	1.5		HCC-1964						N1500 ±.25mmf
C16	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C17	5000		HCC-1926	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C18	220		HCC-1966-1	NPO-SI 220	D6-221			5TCC-T22	10%
C19	15		HCC-1981						N75 5%
C20	1-4		HCV-2130		829-4		CT551		
C21	22		HCC-1981						N330 5%
C22	100		HCC-1922-1	N750-SI 100	TCN-100	CTA6T1U	NT-531	5TCU-T1	N750 10%
C23	50000		HCC-1951	BPD-05	DF-503	BYB6S5		5HK-S5	
C24	220		HCC-1966-1	NPO-SI 220	D6-221			5TCC-T22	10%
C25	470		HCC-1948		D6-471				10%
C26	10000		HCC-1943	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C27	10000		HCC-1943	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C28	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C29	3		HCC-1946						N470 10%
C30	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C31	40		HCC-1972						N330 5%
C32	10		HCC-1904	N750-SI 10	TCN-10				N750 5%
C33	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C34	10000		HCC-1943	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C35	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C36	10000		HCC-1943	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C37	10000		HCC-1943	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C38	10000		HCC-1943	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C39	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C40	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C41	10000		HCC-1943	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C42	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C43	10000		HCC-1943	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C44	330		HCC-1937		D6-331				10%
C45	330		HCC-1937		D6-331				10%
C46	330		HCC-1937		D6-331				10%
C47	2000		HCC-1954						10%
C48	10000		HCC-1943	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	ANDREA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C49	100		HCC-1922-1	N750-SI 100	TCN-100	CTA6T1U	NT-531	5TCU-T1	N750 10%
C50	100		HCC-1922-1	N750-SI 100	TCN-100	CTA6T1U	NT-531	5TCU-T1	N750 10%
C51	1000		HCC-1956						10%
C52	1000		HCC-1956						10%
C53	680		HCC-1958		MD-681				10%
C54	150		HCC-1976	NPO-DI 150	DD-151	L10T15	ZT-5315	5TCC-T15	10%
C55	3000		HCC-1977						10%
C56	5000		HCC-1926	BPD-005	DD-502	BYA10D5	DC525	5HK-D5	
C57	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C58	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C59	120		HCC-1979		DTN-120	C10T12U			N750 10%
C60	.01	100	HCT-1042	P288N-01	D6-103	CUB2SI	GEM-411	2TM-SI	
C61	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C62	150		HCC-1976	NPO-DI 150	DD-151	L10T15	ZT-5315	5TCC-T15	10%
C63	150		HCC-1976	NPO-DI 150	DD-151	L10T15	ZT-5315	5TCC-T15	10%
C64	2000		HCC-1954						10%
C65	2000		HCC-1954						10%
C66	.01	100	HCT-1042	P288N-01	D6-103	CUB2SI	GEM-411	2TM-SI	10%
C67	10000		HCC-1970	BPD-01	DD-103	BYA10SI	DC511	5HK-SI	
C68	4700		HCC-1978						10%
C69	4700		HCC-1978						10%
C70	10000	1400	HCC-1963	DAC-27		HVE16SI		20HKB-SI	

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	ANDREA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	1meg	½	GRV-863	BT-7417	A47F3-1meg	Q18-137X	UT-440	Loudness, Tap ⓐ 100K
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R2A	1meg	½	GRV-865	B-70	A47-1meg-Z	Q13-137	U53	Bass
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R3A	1meg	½	GRV-864	B-70	A47-1meg-Z	Q13-137	U53	Treble
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R4	500Ω	2(WW)	GRV-856					Hum Balance

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	ANDREA PART No.	NOTES
R5	120K		GRC-280	
R6	1000Ω		GRC-210	
R7	47Ω		GRC-211	
R8	560K		GRC-305	
R9	3300Ω		GRC-220	
R10	12K		GRC-272	
R11	68Ω		GRC-214	
R12	470K		GRC-228	
R13	1000Ω		GRC-210	
R14	27K	1	GRC-234	
R15	270Ω		GRC-369	
R16	100K		GRC-258	
R17	180K		GRC-336	
R18	3300Ω		GRC-220	
R19	1800Ω		GRC-346	
R20	18K		GRC-367	
R21	4000Ω	10(WW)	GRW-558	
R22	22K		GRC-201	
R23	180K		GRC-336	
R24	1000Ω		GRC-210	
R25	100Ω		GRC-216	
R26	560K		GRC-305	
R27	330K		GRC-301	
R28	1000Ω		GRC-210	
R29	100Ω		GRC-216	
R30	180K		GRC-336	
R31	100K		GRC-258	
R32	1000Ω		GRC-210	
R33	47Ω		GRC-211	
R34	68Ω		GRC-214	
R35	39K		GRC-247	
R36	470Ω		GRC-213	

ITEM No.	RATING OHMS	RATING WATT	ANDREA PART No.	NOTES
R37	6800Ω		GRC-221	
R38	1200Ω		GRC-370	
R39	6800Ω		GRC-221	
R40	1meg		GRC-274	
R41	220K		GRC-270	
R42	39K		GRC-247	
R43	470K		GRC-228	
R44	1meg		GRC-274	
R45	1meg		GRC-274	
R46	1meg		GRC-274	
R47	22K		GRC-201	
R48	100K	1	GRC-349	
R49	2200Ω		GRC-219	
R50	100K		GRC-258	
R51	4.7meg		GRC-343	
R52	100K	1	GRC-349	
R53	22K		GRC-201	
R54	820K		GRC-246	
R55	1meg		GRC-274	
R56	68K		GRC-204	
R57	100K	1	GRC-349	
R58	2200Ω		GRC-219	
R59	220K		GRC-270	
R60	39K		GRC-247	
R61	39K		GRC-247	
R62	39K	1	GRC-368	
R63	2200Ω		GRC-219	
R64	1meg		GRC-274	
R65	330K		GRC-301	
R66	68K		GRC-204	
R67	5.6Ω 5%	(WW)	GRC-293	

TUNER PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					
		ANDREA PART No	Meissner PART No.	Merit PART No	Miller PART No.	Ram PART No	NOTES
L1	FM Ant. Trans.	SA-412					
L2	RF Choke	SA-415					3.3 Microhenries
L3	FM RF Coil	SA-413					
L4	FM Osc. Coil	SA-414					
L5	RF Choke			SW-631	4609		5 Microhenries ①
L6	Loop Stick	SA-402					
L7	AM RF Trans.	SA-403					
L8	AM Osc. Coil	SA-404			70-OSC *		* Disregard primary
L9	1st. FM IF	SA-408	16-3487	FM-254	1463		
L10	1st. AM IF	SA-405	16-6758	BC-352	12-C1	RF-1	
L11	2nd. FM IF	SA-409	16-3487	FM-254	1463		
L12	2nd. AM IF	SA-406	16-6758	BC-353	12-C2	RF-2	
L13	Fil. Choke	SA-418					2 Microhenries
L14	3rd. FM IF	SA-410					
L15	Fil. Choke	SA-417					2 Microhenries
L16	Ratio Det.	SA-411	17-3498	FM-255	1465		
L17	Fil. Choke	SA-416					2 Microhenries
L18	RF Choke	SA-415					3.3 Microhenries ②
L19	10KC Filter	SA-407					

① Some versions may use a 3.3 microhenry coil (Part #SA-415).
② Some versions may use a 5 microhenry coil.

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	ANDREA PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1						

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	ANDREA PART No.	JENSEN PART No.	WALCO PART No.	
M2	(LP)	†G-1 or ♦G-1D	†W-68MGS or ♦W-68MGD	† Jewel ♦ Diamond
	(78)	†G-3 or ♦G-3D	†W-68S or ♦W-68D	

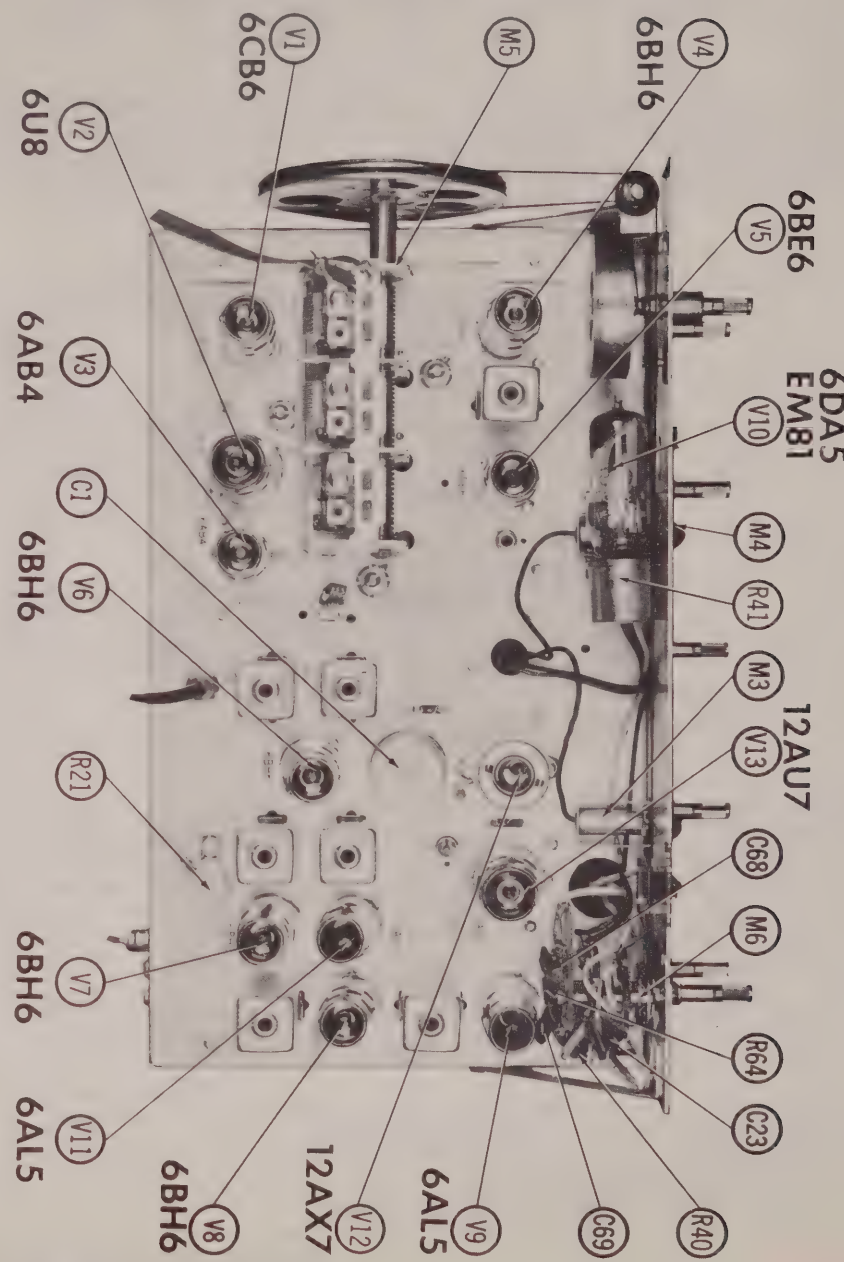
MISCELLANEOUS

ITEM No.	PART NAME	ANDREA PART No.	NOTES
M3	Lamp	FM-696	#47
M4	Lamp	FM-696	#47
M5	Tuning Cap.	HCV-2128	5 Gang, AM - FM; AM Sections: Ant. 29-435mmf, RF22-425mmf, Osc. 24-197mmf
M6	Switch	FM-5513	Selector, Rotary Wafer Type
M7	Switch	FM-5512	Compensator, Rotary Wafer Type
M8	Switch	FM-5520	Power, On-Off, Rotary Snap Type
	Switch	FM-5497	Compartment Light
M9	Receptacle	FM-5162	AC
M10	Receptacle	FM-5162	AC
M11	Jack	FM-5514	Strip Assembly (Insulating Strip #FM-5514-1)
	Socket	FM-5064	Compartment Light, 2 Prong
	Plug	FM-5067	Compartment Light, 2 Prong
M12	Socket	FM-5515	Dial Light, 2 Used

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

TUNER CHASSIS—TOP VIEW



RP24WA PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V14	AF Amp. -Phase Inv.	12AX7	
V15	Output	6V6GT	
V16	Output	6V6GT	
V17	Output	6V6GT	
V18	Output	6V6GT	
V19	Rectifier	5Y3GT	
V20	Rectifier	5Y3GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	ANDREA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C71A	▲40	450	HCE-1340	AFH2-57	B0450	FP238	TMD-54	D-235	TVL-2764
B	▲40	450							
C72A	■20	450	HCE-1324	AFH2-88	B0640	FP231.3	TMD-73	D-350	TVL-2702
B	▲10	25							
C73	20	25	HCE-1347	PRS50V20	BBR20-25	TC45	TD-25-25	MQ-0320	TVA-1410
C74	6	10VAC	HCE-1343	AC-PRS10V8	BBR12-150 †	TC43 †	TD-12-150 †	MT-1512 †	R2235 *
					BBR12-150 †	TC43 †	TD-12-150 †	MT-1512 †	

† Connect negative leads together. * Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	ANDREA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C75	680		HCC-1958		MD-681				10%
C76	.1	600	HCT-1002	P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	
C77	.1	600	HCT-1002	P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		ANDREA PART No.	NOTES
	OHMS	WATT		
R68	1meg		GRC-274	
R69	220K		GRC-270	
R70	560Ω		GRC-250	
R71	5600Ω		GRC-248	
R72	100K		GRC-258	
R73	220K		GRC-270	
R74	1800Ω		GRC-346	
R75	100Ω		GRC-216	
R76	100K		GRC-258	
R77	125Ω	10(WW)	GRW-552	
R78	100Ω		GRC-216	
R79	100K		GRC-258	
R80	100Ω		GRC-216	
R81	100Ω		GRC-216	
R82	400Ω	5(WW)	GRW-559	
R83	10K		GRC-304	
R84	2400Ω	15(WW)	GRW-562	
R85	10K	5(WW)	GRW-563	
R86	2400Ω	15(WW)	GRW-562	

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA						
	CURRENT (Measured)	DC RES.	INDUCTANCE (0 CURRENT 1000 ~)	ANDREA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L20	.200A	58Ω	3 Hy.	ST-3078-1	C5-30	C-2991	F-308	C-2325	26C43 ①	C-17X

① Drill new mounting hole.

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	ANDREA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V @1.38A	600VCT @.200A	5V @3.4A	ST-3091		P-2836			26R91	
	SEC. 3	SEC. 4	SEC. 5							
	6.3V @5.1A	6.3V @.5A								

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	ANDREA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	3800Ω CT	3-4Ω	ST-3089-1	Z1401 ①	A-3129①		A-3802 ①	22S95	S-42A ①	① Drill new mtg. holes.

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	ANDREA PART No.	QUAM PART No.	
SP1	12"	PM	6-8Ω	SL-4029-1	12A10	
SP2	12"	PM	6-8Ω	SL-4028-1	12A10	
SP3	4"	PM	6-8Ω	SL-4032	4A15TZ6.4	
SP4	4"	PM	6-8Ω	SL-4032	4A15TZ6.4	

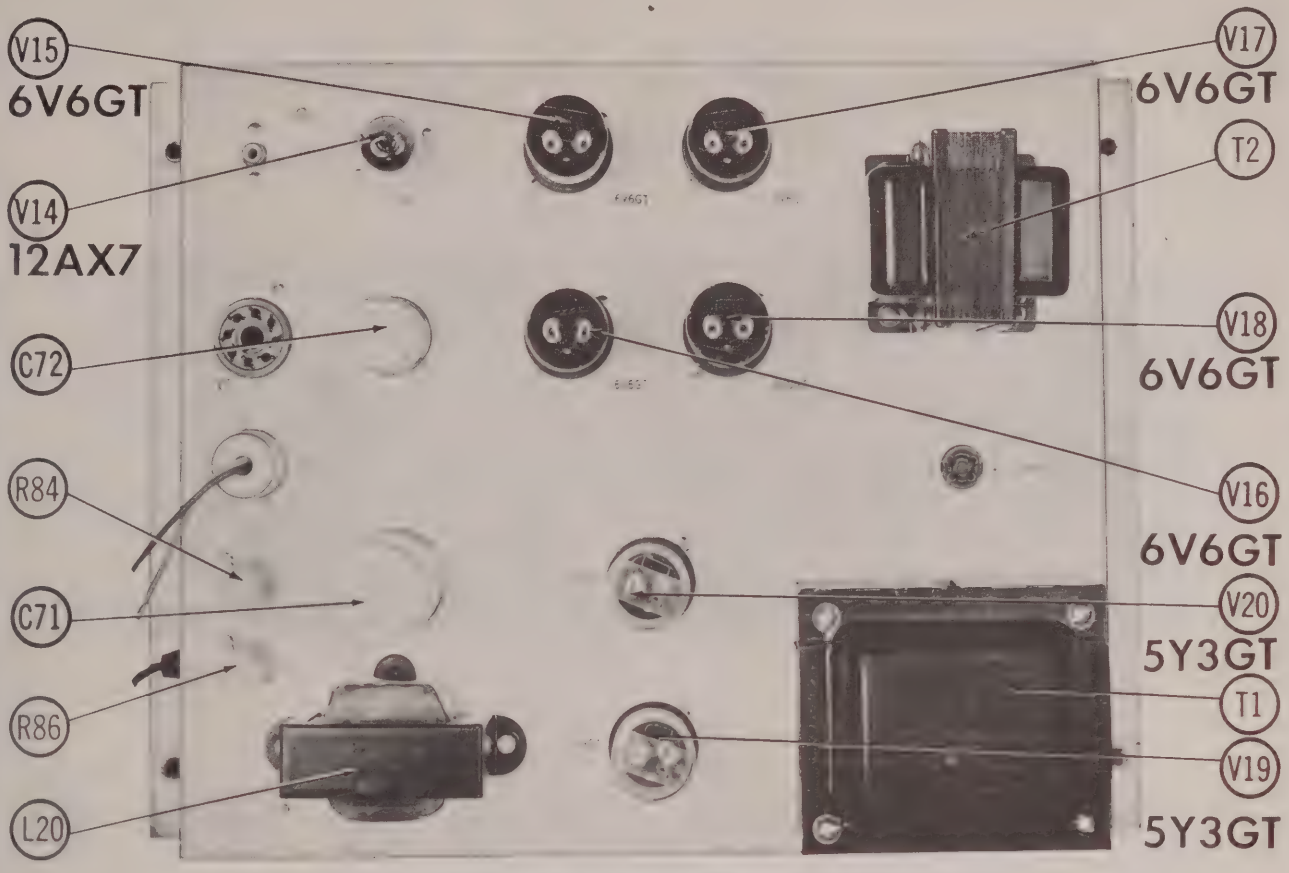
MISCELLANEOUS

ITEM No.	PART NAME	ANDREA PART No.	NOTES
M13	Lamp	FM-696	#47
M14	Socket	FM-5399	Speakers, 4 Prong
M15	Socket	FM-5446	Pilot Light, 2 Prong
M16	Socket	FM-5499	Octal, 8 Pin, Power To Tuner
M17	Socket	FM-5360	Audio Output
M18	Plug	FM-5447	Pilot Light, 2 Prong
	Plug	FM-5067	Compartment Light, 2 Prong
	Plug	FM-5400	Speakers, 4 Prong, Miniature

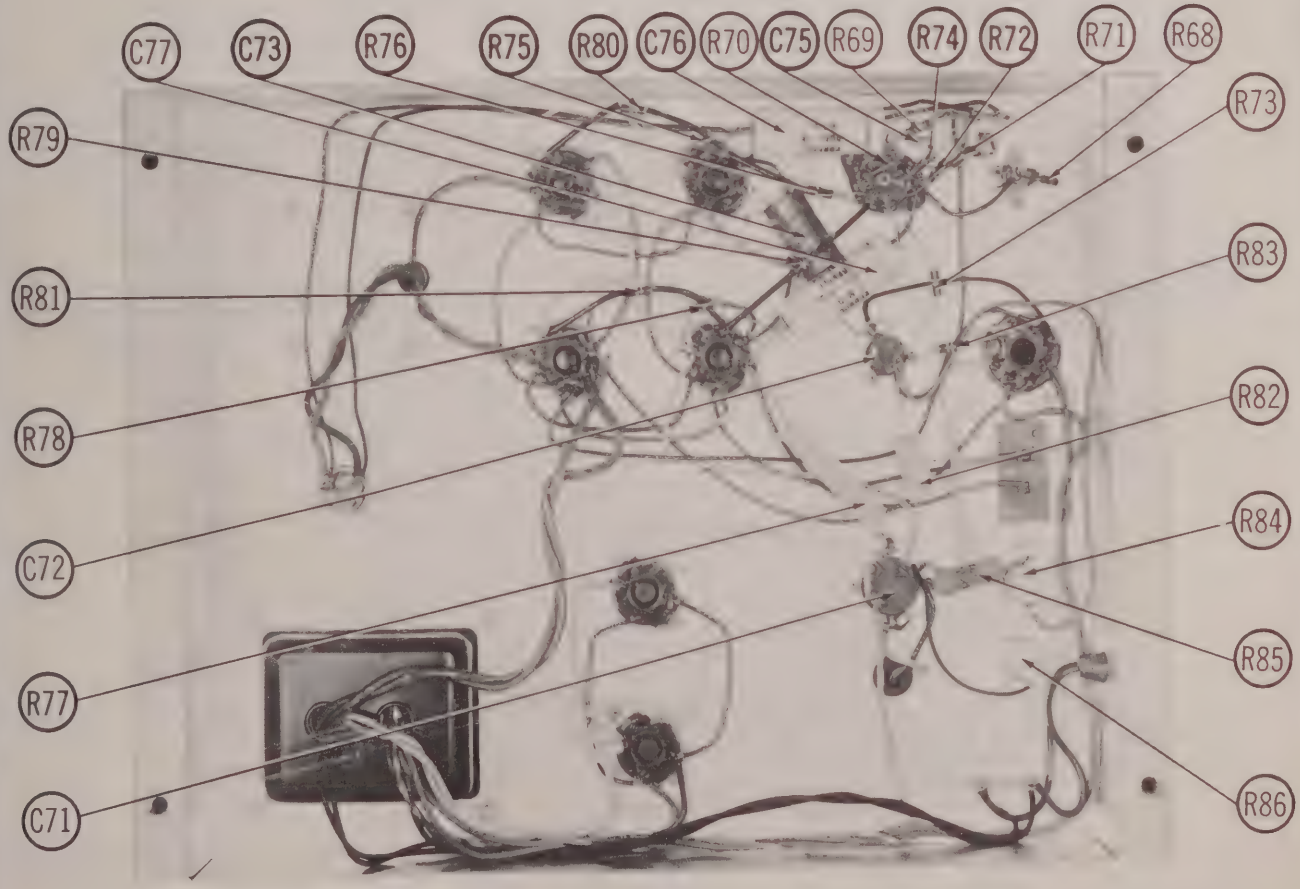
WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

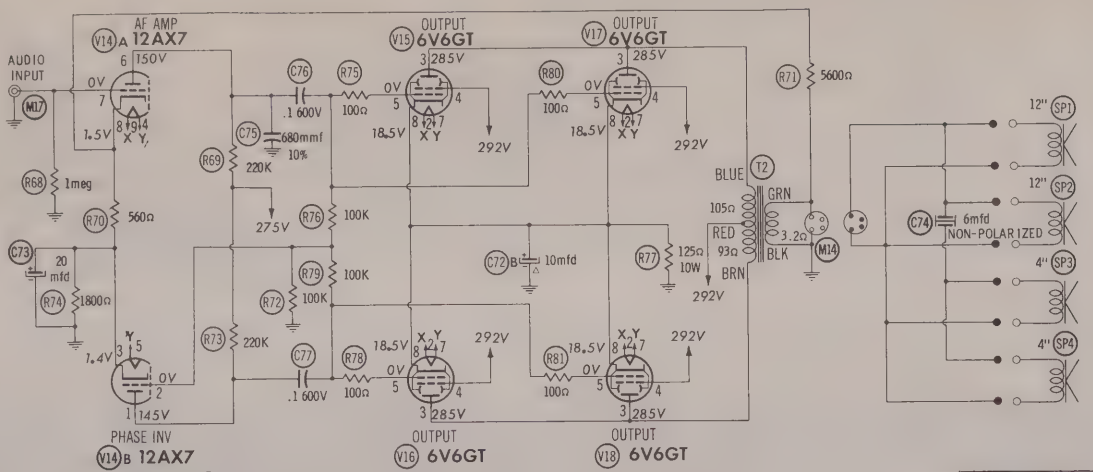
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

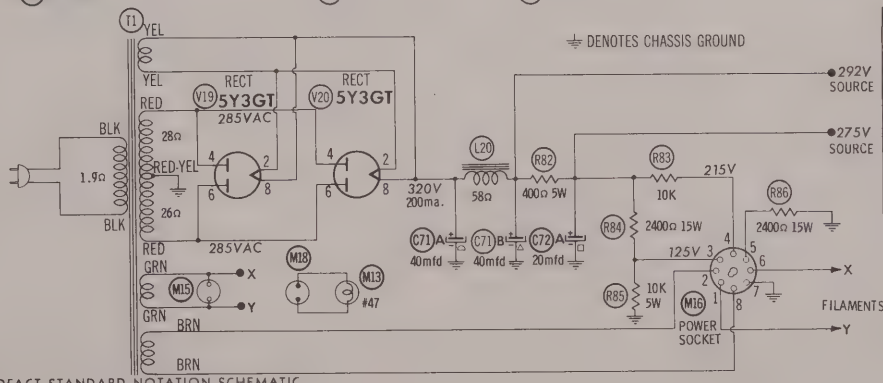


AMP RP24WA CHASSIS - TOP VIEW



AMP RP24WA CHASSIS - BOTTOM VIEW





1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V14	12AX7	†220K	100K	1800Ω	0Ω	0Ω	†220K	1meg	1600Ω	.1Ω
V15	6V6GT	NC	.1Ω	†160Ω	†58Ω	200K	TP	0Ω	125Ω	
V16	6V6GT	NC	.1Ω	†160Ω	†58Ω	200K	TP	0Ω	125Ω	
V17	6V6GT	NC	.1Ω	†150Ω	†58Ω	200K	NC	0Ω	125Ω	
V18	6V6GT	TP	.1Ω	†150Ω	†58Ω	200K	NC	0Ω	125Ω	
V19	5Y3GT	NC	¶	NC	28Ω	NC	26Ω	NC	¶	
V20	5Y3GT	NC	¶	NC	28Ω	NC	26Ω	NC	¶	

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
† MEASURED FROM PIN 8 OF V20.
NC NO CONNECTION.
TP TIE POINT.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
Howard W. Sams & Co., Inc. 1958

416-4

AMP RP24WA SCHEMATIC

P12WB PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V21	AF Amp. -Phase Inv.	12AX7	
V22	Output	6V6GT	

ITEM No.	USE	TYPE	NOTES
V23	Output	6V6GT	
V24	Rectifier	5U4GB	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA ANDREA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C78A	▬40	450	HCE-1345	AFH4-78-10	D0850	FP431.2	TMQ-99	Q-385	TVL-4736
B	▬40	450							
C	▲10	450							
D	20	25							
C79	20	25	HCE-1347	PRS50V20	BBR20-25	TC45	TD-25-25	MQ-0320	TVA-1410

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA ANDREA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C80	.05	600	HCT-1032	P688N-05	DF-503	CUB6S5	GEM-615	6TM-S5	10%
C81	470		HCC-1959		MD-471				
C82	.05	600	HCT-1032	P688N-05	DF-503	CUB6S5	GEM-615	6TM-S5	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	ANDREA PART No.	NOTES
R87	1meg		GRC-274	
R88	470K		GRC-228	
R89	470Ω		GRC-213	
R90	2200Ω		GRC-219	
R91	220K		GRC-270	
R92	470K		GRC-228	
R93	1800Ω		GRC-346	
R94	330K		GRC-301	

ITEM No.	RATING OHMS	RATING WATT	ANDREA PART No.	NOTES
R95	270Ω	5(WW)	GRW-553	
R96	330K		GRC-301	
R97	450Ω	5(WW)	GRW-560	
R98	750Ω	7(WW)	GRW-561	
R99	10K		GRC-304	
R100	2400Ω	15(WW)	GRW-562	
R101	10K	5(WW)	GRW-563	
R102	2400Ω	15(WW)	GRW-562	

TRANSFORMER (POWER)

ITEM No	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA ANDREA PART No	Halldorson PART No.	Merit PART No.	Ram PART No	Stancor PART No.	Thordarson PART No.	Triad PART No.
T3	117V @1.06A	600VCT @.140A	5V @2.5A	ST-3090						
	SEC. 3	SEC. 4	SEC. 5							
	6.3V @4A	6.3V @.5A								

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA ANDREA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T4	6300Ω CT	3-4Ω	ST-3076-1 Ⓘ	Z1002	A-2901	AU-604	A-3823	24S61	S-55Z	Ⓘ Alternate Part #ST-3067-6

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA ANDREA PART No.	REPLACEMENT DATA QUAM PART No.	NOTES
	12"	PM		SL-4035		
	6"	PM		SL-4034		
	4"	PM	6-8Ω	SL-4032	4AI5TZ6.4	

MISCELLANEOUS

ITEM No.	PART NAME	ANDREA PART No.	NOTES
M19	Lamp	FM-696	#47

CABINETS & CABINET PARTS

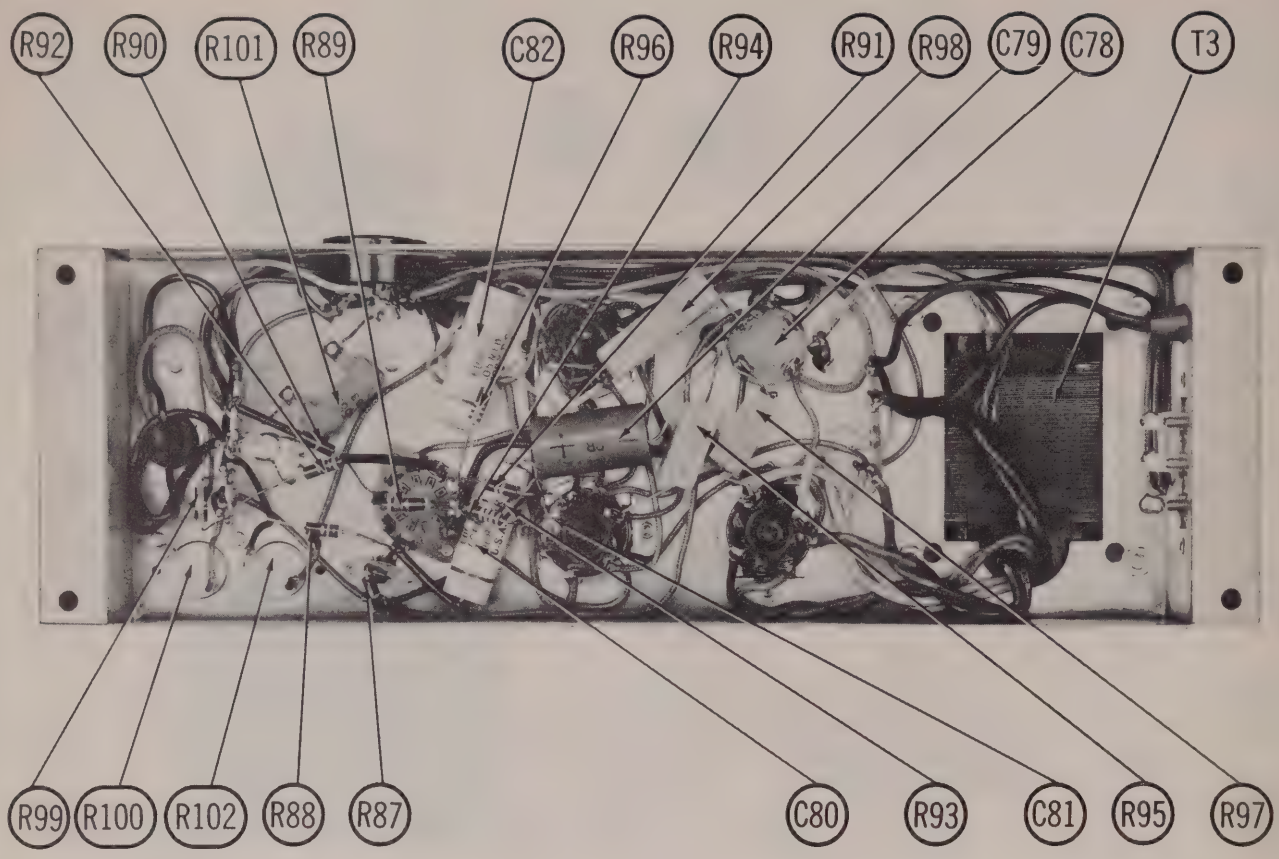
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Dial Pointer	FM-5502	
Dial Glass	FM-5503	

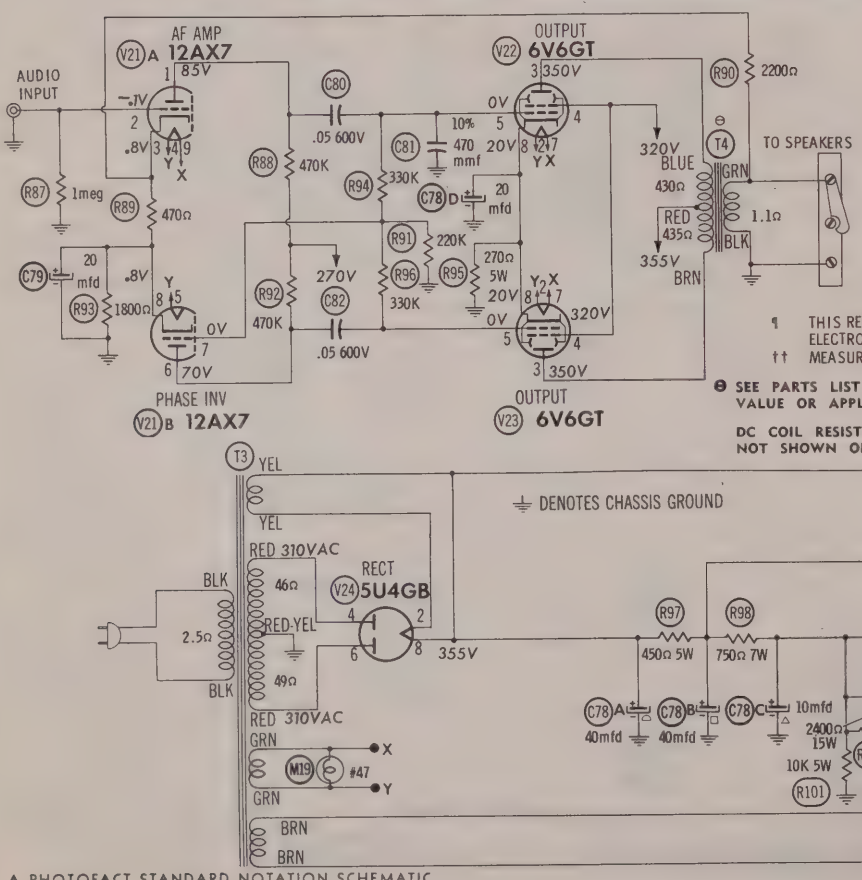
WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)



AMP P12WB CHASSIS - BOTTOM VIEW



Pin No.	V21 12AX7	V22 6V6GT	V23 6V6GT	V24 5U4GB
1	†† 470K	NC	NC	NC
2	1meg	0Ω	0Ω	¶
3	1000Ω	†† 430Ω	†† 435Ω	TP
4	0Ω	†† 450Ω	†† 450Ω	46Ω
5	0Ω	550K	550K	NC
6	†† 470K	TP	NC	49Ω
7	220K	.1Ω	.1Ω	NC
8	1000Ω	270Ω	270Ω	¶
9	.1Ω			

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.

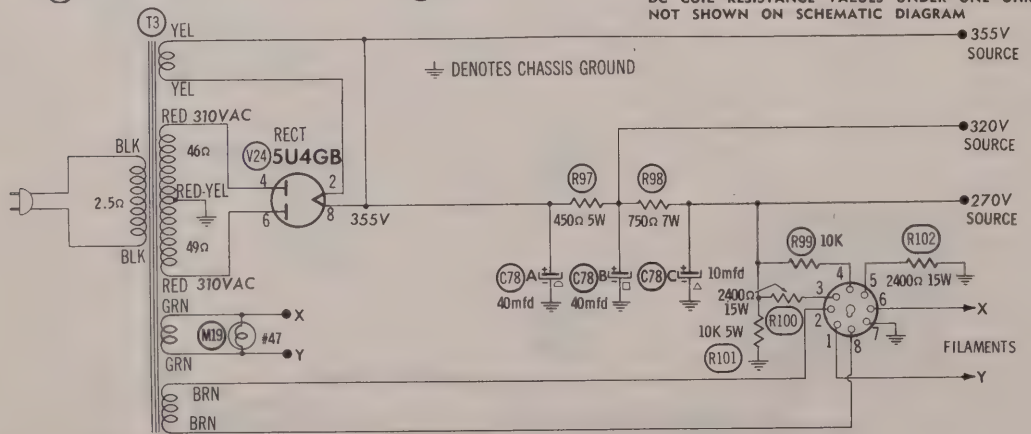
†† MEASURED FROM PIN 8 OF V24

NC NO CONNECTION

TP TIE POINT

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM



A PHOTOFACT STANDARD NOTATION SCHEMATIC

Howard W. Sams & Co., Inc. 1958

416-4

AMP P12WB SCHEMATIC

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

EKOTAPE MODELS
270 Series, 280 Series

EKOTAPE MODELS
270 Series, 280 Series

EKOTAPE MODELS
270 Series, 280 Series

GENERAL INFORMATION

The Webster Electric Ekotape Recorder Models 270 and 280 series are essentially alike in basic design and construction. The main difference between the Models lies in the power input application and the type heads used in the various models.

These recorders have two tape speeds, 3 3/4 ips and 7 1/2 ips. All Models have an automatic stop feature, that is, when tape runs out in either Forward or Rewind position, the power to the motor is switched off.

Recordings can be made from a radio, television receiver or phonograph, in addition to those made directly from the microphone. Recordings can be played back through the self-contained speaker or an external speaker.

CAUTION: Severe damage may result if connection is made to a direct current (DC) line. Check serial nameplate for proper current and voltage application.

Manufactured by:

Webster Electric Company
Racine, Wisconsin

This material compiled and published by

HOWARD W. SAMS & CO., INC., INDIANAPOLIS, INDIANA

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SET 416 FOLDER 5

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2. SPECIFICATIONS

The following specifications apply for Model 270 and Model 280 except where otherwise designated:

SPEEDS: 3 3/4 and 7 1/2 inches per second. "Fast Forward" and "Rewind" 15 times normal playing speed.

HEADS: Half-track recording head.

OUTPUT: 8.0 watts maximum.

DISTORTION: 1.6% total harmonic at 6.0 watts at 400 cps. 5.5% intermodulation at 6.0 watts using 60 and 7000 cycles.

FREQUENCY RESPONSE: 30 to 15,000 cps.

SIGNAL TO NOISE RATIO: 43db.

WOW AND FLUTTER: 0.2% maximum at 7 1/2 ips. 0.3% maximum at 3 3/4 ips.

MUTING: Built-in or external speaker is automatically silenced in "Rewind" and "Fast Forward" positions.

ERASE: Automatic in "Record" position. Interlocking control prevents accidental erasure of recordings.

MONOMATIC CONTROL: Single vernier geared knob for easy, simple control of tape; selects tape direction — "Fast Forward", "Standard Forward", "Fast Rewind", and "Stop".

AUTOMATIC STOP: Switch stops motor when tape runs out in either "Forward" or "Rewind" positions.

INSTANT STOP AND START: Manual Control (furnished) or Electric Control (an accessory) start and stop tape instantly without disturbing pre-set controls.

AMPLIFIER CONTROLS: Tone balancing control combined with power on/off switch. Volume control.

RECORDING LEVEL INDICATOR: Professional meter type. Edge lighted by pilot light.

INPUTS: Radio/Phono jack; 0.5 megohm impedance. Microphone jack; 0.5 megohm impedance. Three millivolt RMS minimum signal at microphone jack drives amplifier to full power output.

SPEAKERS: (Model 270) Built-in 6" x 9" oval PM type. Cut-off switch disconnects speaker, if desired, while recording or using external speakers. (Model 280) Two built-in Speakers — 6" x 9" oval PM type for low and middle frequencies, 3" round for high frequencies with crossover network. Cut-off switch disconnects built-in speakers, if desired, while recording or using external speakers.

OUTPUT JACKS: External speaker jack; 8 ohm impedance. Head output jack; connects playback head to high fidelity pre-amplifier.

PROGRAM SELECTION FINDER: Odometer type, geared to give 1000 count for 1800 feet of tape.

POWER REQUIREMENTS: 117 volts, 60 cycles, 115 watts, 1.18 amperes. Grounded 3-prong receptacle for power cord provides for 3-conductor cable (an accessory) where codes so specify.

TUBE COMPLEMENT: Seven tubes; one 5879, two 12AX7, three 6AQ5, one 5Y3GT.

MODEL 271: Same as 270 except that power input is 115-230 volts, 50 cycles, 115 watts, 1.18/.59 amperes.

MODEL 270ST: Same as 270 except that record head is full track, with separate erase head.

MODEL 281: Same as 280 except that power input is 115-230 volts, 50 cycles, 115 watts, 1.18/.59 amperes.

MODEL 280ST: Same as 280 except that record head is full track, with separate erase head.

3. DESCRIPTION OF MODELS

All models covered by this bulletin are similar in basic design and construction. All are two-speed recorders which operate at 3 3/4 or 7 1/2 inches per second tape speed, using Class A amplifiers.

Models 270, 270ST, 271, 280, 280ST, and 281 are housed in portable cases. Each model is equipped with a control knob for remote starting and stopping of the mechanism, and a counter for indicating the length of tape wound on the take-up reel. All models are equipped with separate equalization networks for each speed and each model has a muting switch for silencing the speakers during "Fast Forward" and "Rewind".

4. TROUBLE SHOOTING

For quick location of parts, as mentioned in Trouble Chart below, to their respective reference numbers (given in parenthesis) refer to Figures 4 & 5, Figures 1, 3, or 6, and Figures 7, 8, & 9.

TROUBLE CHART

TROUBLE	CAUSE	REMEDY
Motor (137) and amplifier inoperative with switch "on".	Power supply defect	Check voltages and resistances as designated on schematic diagram (Fig. 9, page 19).
	Damaged power cord.	Repair or replace.
	Broken or defective tone control switch.	Replace switch.
No sound or sound is fuzzy, faint, or distorted.	Over-recorded or under-recorded tape.	See owner guide for proper operation.
	Amplifier trouble.	See paragraph 5d (page 7). Check voltages and resistances as designated on schematic diagram (Fig. 9, page 19).
	No bias current.	Oscillator tube (V6) defective. Open bias oscillator circuit. Loose connections to record head. Bad oscillator coil (L1).
	Pressure pads not operating properly.	See paragraph 10 (page 9).
	Dirty head (44).	Clean. Do not remove or change position of head (See paragraphs 5b & 6, page 7).
	Worn or dirty pressure pads.	Clean or replace. (See paragraph 10, page 9).
	Record head coil inoperative.	Check oscillator bias voltage and head coil continuity. (See paragraph 9, page 8).
No sound but motor operates and tubes light.	Amplifier trouble.	See paragraph 5d (page 7). Check voltages and resistances as designated on schematic diagram (Fig. 9, page 19).
	Open circuit to speaker.	Check speaker cable continuity. Check speaker switch (M7) operation. Check operation of muting switch (M6). Check external speaker jack (M13).
Erase incomplete or no erase.	Dirty head (44).	Clean. (See paragraphs 5b & 6, page 7.)
	Oscillator not operating.	Check voltage from oscillator coil (L1) tap (terminal 2) to ground with an a-c vacuum tube voltmeter. Should read at least 45 VAC.
	Damaged erase coil.	Check continuity.
	Pressure pads worn, damaged, or out of adjustment.	Adjust or replace. (See paragraph 10, page 9.)

TROUBLE	CAUSE	REMEDY
Does not record.	Faulty microphone or cord.	Replace.
	Faulty input jack (M11) or (M12).	Check and replace.
	Faulty tube.	Check tubes V2 - V7.
	Low bias voltage.	Check voltage across full oscillator coil (L1) secondary winding (terminals 1 & 3) with an a-c vacuum tube voltmeter. Should read at least 180 VAC.
	Dirty Head (44).	Clean.
	Pressure pads worn, aged, or out of adjustment.	Adjust or replace. (See paragraph 10, page 9.)
	Open play-record coil.	Check continuity.
No playback; amplifier hiss only.	Open play-record coil.	Check continuity.
	Open input circuit.	Check selector switch (M3).
	Faulty tube.	Check V1.
Howl or ringing sound during playback.	Microphonic tube.	Replace defective tube.
	Acoustical feedback when recorded.	Erase tape and re-record with speaker "off", or move micropnone away from speaker.
Poor high frequency response.	Bad component in equalization network.	Check and replace defective components in equalization circuitry.
	Poor contact on selector switch (M3).	Replace switch.
	Dirty head (44).	Clean. (See paragraphs 5b & 6, page 7.)
	Pressure pads worn, damaged, or out of adjustment.	Adjust or replace. (See paragraph 10, page 9.)
Loud hum on playback.	Bad tone control switch.	Replace switch. (See paragraph 5d, page 7.)
	Open power supply filter capacitor (C1) or (C2).	Check and replace.
Recording unintelligible on playback.	Improper record bias.	Check oscillator circuit components. Replace bad parts.
	Pressure pads worn, damaged, or out of adjustment.	Adjust or replace. (See paragraph 10, page 9.)
	Malfunction in playback pre-amplifier circuit.	Check circuit components & (V1). Replace defective parts.
Distorted bass response.	Bad component in equalization network.	Check and replace defective components in tone control circuitry.
Output muffled or low.	Dirty head (44).	Clean. (See paragraphs 5b & 6, page 7.)
	Weak amplifier tube.	Check tubes and replace as required.
	Bad microphone or cable.	Check, repair, or replace.

TROUBLE CHART (CONT.)

TROUBLE	CAUSE	REMEDY
Tape overruns from "Rewind" to "Stop".	Damaged, worn, or improperly adjusted take-up reel brake (71).	Check brakes. Repair, replace, or adjust. (See paragraph 13a, page 12.)
Tape overruns from "Fast Forward" to "Forward".	Worn, damaged, or improperly adjusted supply reel brake.	Check brakes. Repair, replace, or adjust. (See paragraph 13b, page 12.)
"Take-up" or "Fast Forward" inoperative, noisy, or irregular.	Worn or improperly adjusted clutch (106).	Repair, replace, or adjust. (See paragraph 14, page 12.)
	Brake dragging on supply reel.	Adjust brakes. (See paragraph 13a, page 12.)
	Take-up reel support (80) dirty or damaged.	Clean, lubricate, or replace as necessary.
	Worn or damaged idler (117).	Replace. (See paragraph 14c, page 12.)
	Take-up reel support plate spring (79) broken.	Replace. (See Fig. 6, page 12.)
Noisy operation in "Stop" and "Forward" positions.	Worn or damaged idlers (91), (94), (117), or dry bearings.	Repair, replace or lubricate.
	Damaged idler link (113).	Repair.
Tape flares out on supply reel when engaging remote lever assembly.	Worn or damaged supply reel brake, or broken spring (72).	Replace. (See paragraph 13, page 12.)
Remote lever assembly not functioning properly.	Broken return spring (70) or dirty lever assembly (69).	Replace spring (70). (See paragraph 15, page 12.) Lubricate lever (69).
	Pinch roller (28) does not disengage capstan.	Adjust lever assembly (69). (See paragraph 15, page 12.)
Inoperative control knob.	Loose knob set screw (4).	Tighten.
	Loose set screw (24) in pinch roller cam assembly (23).	Adjust cam (23) to proper position and tighten.
Speed selector not functioning properly.	Broken springs (87 or 95) on drive idler assemblies.	Replace. (See paragraph 16a, page 13.)
Unit inoperative when control knob is operated.	Loose control cam (23A).	Adjust and tighten.
	Damaged or worn cam (23A) or shaft and gear (19) assembly.	Replace.
Poor equalization in either or both speeds.	Switch cam assembly (54) loose.	Adjust. (See paragraph 16b, page 13.)
	Bad equalization switch (M4 or M5).	Replace. (See paragraph 16b, page 13.)
	Bad equalization circuit component.	Replace defective component.
Counter inoperative.	Broken belt (102).	Replace belt (102).
Pilot light out, all other operation normal.	Bad pilot light (M2).	Replace pilot light (M2).
"Monkey Chatter" in "Fast Forward" or "Rewind" positions.	Bad muting switch (M6).	Replace.
	Muting switch (M6) tab bent.	Adjust.

TROUBLE CHART (CONT.)

TROUBLE	CAUSE	REMEDY
"Wow" during operation of recorder.	Dragging brake.	Check brake and correct if bad.
	Clutch (106) too tight.	Adjust.
	Oil on drive surface.	Check drive surface and clean per paragraph 6, page 7.
"Flutter" during operation of recorder.	Dirty head (44), pressure pads, flywheel and shaft assembly, or pinch roller (28).	Clean per paragraph 6, page 7.
"Tape-off switch (M8) functions improperly.	Mal-adjustment.	See paragraph 17, (page 13).
	Dirty slide lever (51).	See paragraph 7b, (page 8).
	Improper action between function cam (23), kickout lever (41), and slide lever (51).	Check for proper operation.
	Broken spring (53).	Replace.
Tubes light, amplifier functioning; but motor (137) inoperative.	"Tape-off" switch (M8).	Check that control knob (2) is in "Stop" position.

5. DISASSEMBLY INSTRUCTIONS

All service work will require removal of the unit from its carrying case with the following exceptions:

Cleaning and aligning of the head assembly (44), cleaning, adjustment, or replacement of the brake lever assemblies (71 & 73), remote lever assembly (69), pinch roller and lever assemblies (32), and the pressure pad assembly (38).

a. Refer to Exploded View, Figures 4 & 5 on pages 10 & 11, for location of parts to their respective reference numbers. Remove head cover (10) by removing screw (9).

b. Model 280 — For cleaning of the head (44) and inspection of the pressure pad (38) and muting switch cam assemblies, remove control knobs (1) by pulling "up" and (2 & 3) by removing their respective set screws (4); remove screws (7 & 7A) and washers (8) from top panel, and remove top panel (6). To remove screen panel assembly (14) see "c" below:

Model 270 — To remove top panel (14) and gain access to parts mentioned in preceding paragraph, remove the following: Control knob (1) by pulling "up", control knobs (2 & 3) by removing set screw (4), screw (7A), seven screws (15), and their respective washers (16).

c. Model 280 — To remove tape transport mechanism & amplifier assembly from case, remove seven remaining screws (15) and their respective washers (16) from screen panel assembly (14); slide screen panel assembly upward to remove from its retaining grooves. Turn carrying case on its baggage studs, and with care partially remove the unit from the case. After partial movement disconnect the speaker plug from amplifier chassis, and then proceed to remove unit entirely from case.

In Model 270 removal of unit from its case is in readiness after removing the top panel (see "b" above.) Remove unit as described in "c" above. In Model 270 only four screws (15) and washers (16) located on both ends of the top panel need be removed before removal of unit from its case.

d. To gain access to the internal wiring and components of the amplifier, remove the chassis bottom cover (remove two screws) after following procedure given in "c" above.

e. After servicing the unit, inspect visually for signs of damage and wear, and make certain all parts are in their proper place and properly adjusted. Reassemble by reversing the procedure outlined above. When returning the unit to the case be sure that speaker leads will be clear of all moving parts.

6. CLEANING

When improper operation of the unit calls for cleaning as indicated by the Trouble Chart, follow the procedures outlined below:

a. When trouble is caused by dirt on the head (44), clean the head with a soft, dry cloth. If dirt is thick and caked on the head, moisten the cloth with alcohol or another suitable solvent, and rub gently until the dirt is removed.

NOTE: Do not use a brush or an excessive amount of solvent to clean the head.

b. The flywheel and shaft assembly (129), pinch roller assembly (28), and the two tape guide spacers (59), may be cleaned in the same manner as described in "a" above.

c. If pressure pad assembly (38) has dirt on the pads, brush lightly with a stiff fibre brush. If caked with dirt, worn, or hard, replace the assembly.

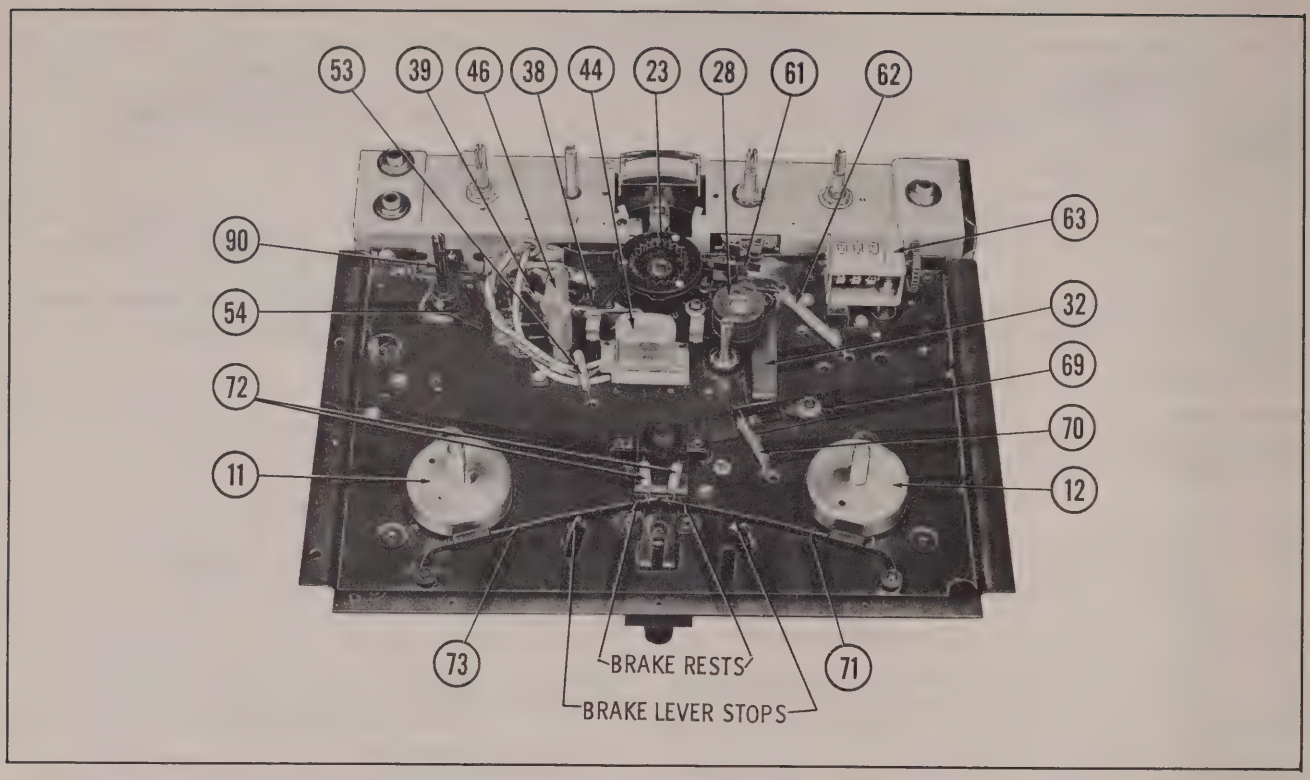


Figure 1. Top View Of Tape Transport Mechanism With Top Panel & Bracket Assembly Removed

7. LUBRICATION

GREASE SHALL BE APPLIED SPARINGLY. Only a thin film of grease is required in all cases. Remove dirty and excessive grease with alcohol or another suitable solvent before relubrication.

a. Oilite bearings are pre-lubricated for the life of the bearing. All that is necessary is light wiping with a clean rag. No further lubrication of the bearings is required.

CAUTION: Never use a cleaning solvent on oilite bearings. Any excess oil may run off the bearings and work its way onto the rubber driving surfaces, causing unsatisfactory operation of the mechanism.

b. Lubricate all cams, levers and sliding parts with a thin film of Liqui – Moly NV Grease.

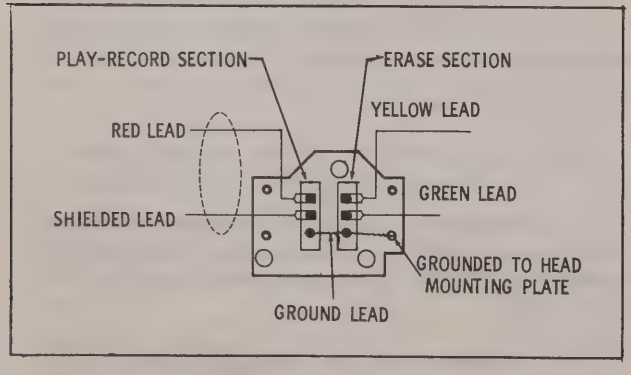


Figure 2. Bottom View Of Head

8. TESTING, ADJUSTMENTS, REPAIR, AND REMOVAL

Use the procedures outlined below to bring the equipment to peak operating efficiency after repair and overhaul or during trouble shooting services.

9. PLAY-RECORD-ERASE HEAD AND OSCILLATOR ADJUSTMENT

To test the oscillator, refer to the circuitry of the schematic diagram, Fig. 9 page 19. Use an AC vacuum tube voltmeter and measure for rated voltages as shown on schematic diagram. If the tests indicate trouble in the play-record-erase head (44), replace head in the following manner.

a. Remove three screws (43) holding head assembly to the mechanism plate and lift head. Remove the record and erase leads (see Fig. 2) from the head terminal pins with care.

b. When installing a new head, make connection of record and erase leads to the terminal pins as indicated in Fig. 2. Tighten snugly the three mounting screws over their respective head mounting springs (45). Thread the unit with tape and adjust the front screw on the head so that tape and pressure pad assembly (38) engage the groove of the head properly. Adjust the two screws on the back of the head for maximum output using a constant frequency tape of 7500 cycles at 7 1/2 ips if available. This same tape may be used at 3 3/4 ips to provide a 3750 cycle alignment signal. If not available, use a previously recorded tape and align head for maximum output of high frequency response with tone control turned to full clockwise position (treble).

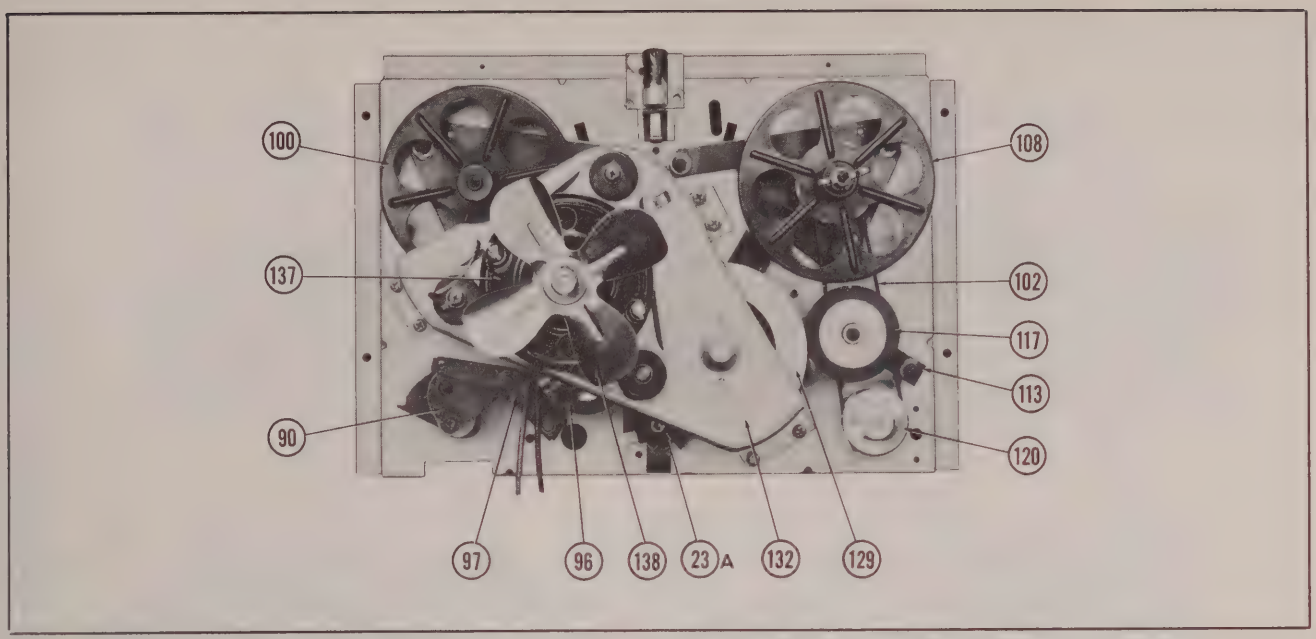


Figure 3. Bottom View Of Tape Transport Mechanism

10. PRESSURE PAD AND LEVER ADJUSTMENTS

Pressure pad and lever assembly (38) should be cleaned (paragraph 6c), adjusted or replaced in the following manner:

a. To adjust pressure pad assembly (38), remove plastic cover and top panel as covered in paragraph 5b.

b. To remove assembly for cleaning, repair or adjustment, remove spring (39) and retaining ring (36). Rotate the pressure pad assembly slightly counter clockwise and lift it off.

c. Reassemble in reverse order and re-lubricate per paragraph 7.

d. Adjust by turning knob (2) to "Forward" position and check to be sure pads engage groove of head properly. If not, bend levers as required.

NOTE: Be sure the face of the felt pads press against the erase and record pole pieces.

11. PINCH ROLLER ADJUSTMENT

If pinch roller (28) is damaged or out of adjustment, replace, clean, and adjust in the following manner:

a. Remove the top panel (6) or (14) as covered in paragraph 5b.

b. Remove springs (33) and (35), and retaining ring (30).

c. Remove both assemblies (32) and (34) and shaft attached to mechanism plate.

d. Clean thoroughly, removing old grease and dirt, and re-lubricate (see paragraph 7). Reassemble in reverse order.

e. Adjust tab on follower lever assembly (34) so pinch roller assembly (28) engages the flywheel shaft just before brake lever assembly (73) releases supply reel pulley (11) from "Stop" position to "Forward", thereby preventing flare out of the tape on the supply reel.

12. IMPROPER "REWIND" OPERATION

If the equipment does not perform properly in "Rewind" position, check as follows:

a. A damaged or worn clutch disc assembly (125) may be the cause of improper "Rewind". To replace a damaged motor pulley (127) and clutch disc assembly (125) remove unit from case as described in paragraph 5c. Unhook springs (87) and (95), unsolder the two motor leads and remove the three mounting screws (135) and washers (134) from the support plate assembly (132). Carefully remove the assembly so as not to damage the drive idler assemblies (91) and (94). Loosen the two Allen head set screws (128) and remove assembly. Reassemble with a new pulley in reverse order.

b. A worn, damaged or dirty supply reel shaft support assembly (77) may be responsible for improper "Rewind". To correct faulty operation, remove the unit from the case as described in paragraph 5c. Unsolder the motor leads. Unhook the two drive idler springs (87) and (95) from the support plate assembly (132). Remove the motor and plate assembly as described in paragraph 12a above. Loosen the two Allen head set screws (101) on the reel pulley assembly (100) to permit removal of the pulley. Pull out the reel shaft assembly (11). Unhook the spring (78) on the reel shaft support assembly (77), and remove the retaining rings (85), spring tension washers (84), and flat washers (83). This will free the reel shaft support assembly. Clean, repair or replace any damaged or worn parts before reassembly. See paragraph 7 for lubrication.

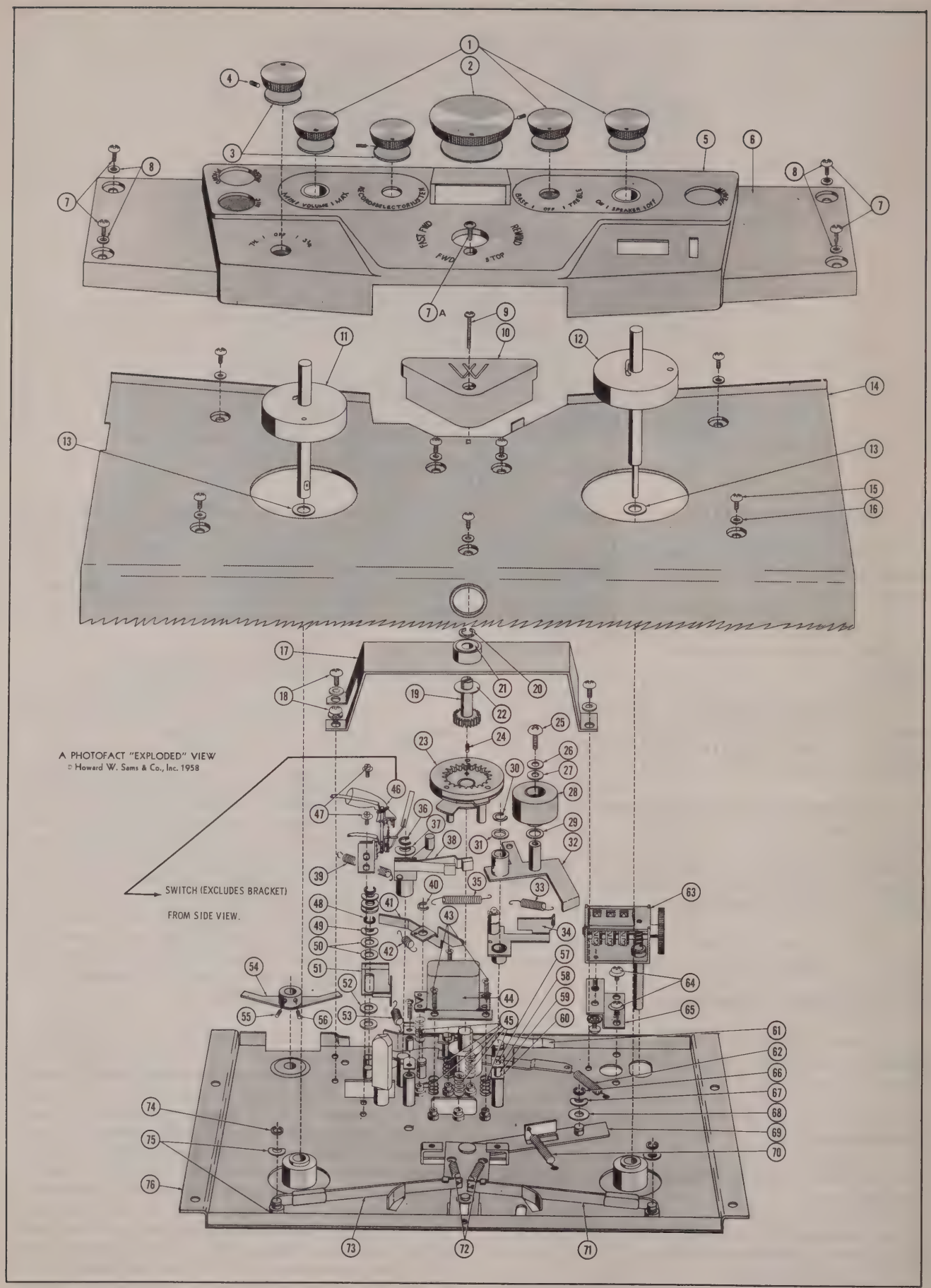


Figure 4. Exploded View Of Parts Above Mechanism Plate

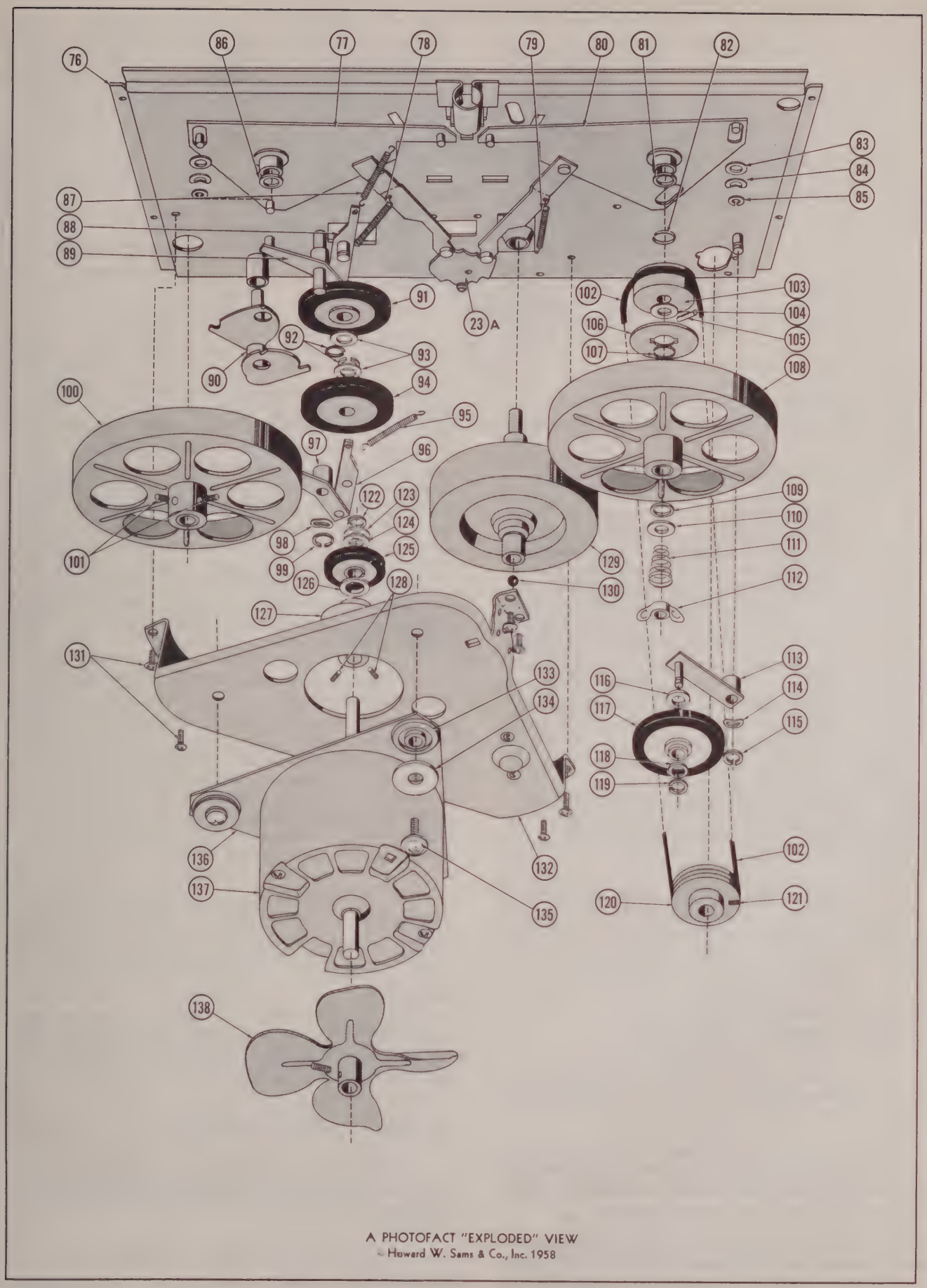


Figure 5. Exploded View Of Parts Below Mechanism Plate

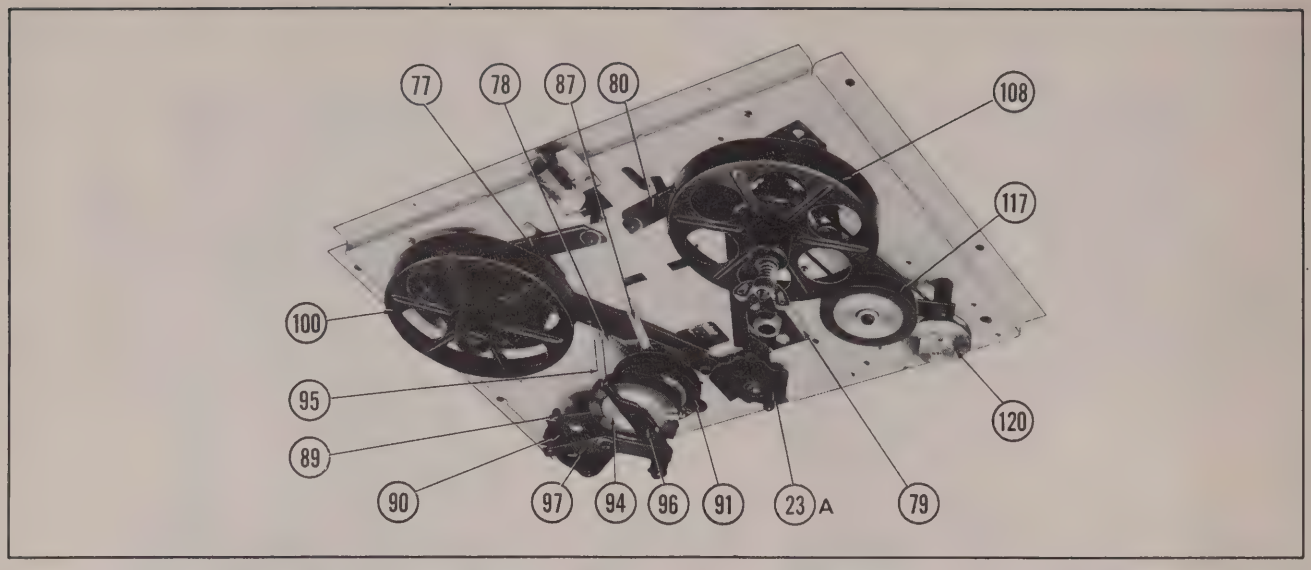


Figure 6. Bottom View Of Tape Transport Mechanism With Motor Assembly And Flywheel Removed

13. ADJUSTING BRAKE LEVER ASSEMBLIES

a. If tape overruns from "Rewind" to "Stop" position, remove top panels (6 & 14) as described in paragraph 5b and 5c. Turn gear and shaft assembly (19) to "Rewind" position (counter-clockwise as far as possible). Adjust the right brake lever assembly (71) so that the brake cup on reel shaft assembly (12) clears the brake lever pad by 1/64 inch maximum. Adjustment is made by bending the brake lever assembly (71) near the bent portion. Refer to Figure 1. Next, turn the gear and shaft assembly (19) from "Rewind" to "Stop" position, observing that the reel brake cup compresses the brake lever pad about 1/64 inch while midway between the two positions. Compression adjustment may be made by bending the brake lever stop on the mechanism panel. When the unit is in the "Stop" position, clearance must exist between brake lever assembly (71), the brake rests located on the remote lever assembly (69), and the brake lever stops located on the mechanism panel.

b. If tape overruns from "Fast Forward" to "Forward", check operation of left brake lever assembly (73) as explained in paragraph 13a, except with the gear and shaft assembly (19) turned to the "Fast Forward" position (clockwise as far as possible).

14. CORRECTING "TAKE-UP" AND "FAST FORWARD" TROUBLES

If the "Take-Up" or "Fast-Forward" drive does not function properly, remove unit from case (paragraph 5c). Check as follows:

a. If "Take-Up" or "Fast Forward" drive is weak, screw the self locking wing nut (112) so the reel shaft will not slip relative to the reel pulley assembly (108) with less than 4 inch-ounces torque.

b. If weak drive persists after the above adjustments, remove the self-locking wing nut (112), spring (111), washer (110), fibre washer (109), and reel pulley assembly (108). Check the felt pad on pulley assembly (108). If the pad is badly worn, replace the reel pulley assembly (108), but if pad shows no excessive wear, remove retaining ring (107), and clutch disk (106). Check to see if drive pin (105) is properly seated. Now, check "U" shaped washer (104) to see that it is not damaged. The washer should have an overall height of 3/32 inch. If at fault repair or replace washer. If pin (105) is worn or damaged, replace. Oil reel pulley assembly (108) slightly (see paragraph 7a) and reassemble. Adjust wing nut (112) to give a torque load on the reel shaft (12) of 4-5 inch-ounces.

c. Excessive noise in "Forward" or "Fast Forward" position indicates a dirty or damaged idler assembly (117), or dirty bearings on the takeup shaft or pulley assembly. To check, remove unit from case (paragraph 5c), and inspect idler assembly and determine if dirty or damaged. Clean any dirt from idler tire and bearing. Clean flywheel and shaft assembly (129), reel pulley assembly (108), (drive area only), with a suitable solvent (see paragraph 6). Re-lubricate as necessary (see paragraph 7).

d. If noise still exists and corrective measure 14c has been exercised, check reel shaft assembly (12). To disassemble follow procedure outlined in paragraph 14b and in addition remove two set screws from pulley (103), retaining ring (82), fibre washer (81), reel shaft assembly (12), and fibre washer (13). Clean and inspect all parts for wear or damage. Clean the bearing in reel shaft support assembly (80) and inspect bearing. Re-lubricate (paragraph 7), replace any damaged parts, and re-assemble in order shown in Figure 5.

15. REMOTE CONTROL INOPERATIVE

To correct an improperly functioning remote lever assembly (69), disassemble the unit as covered in paragraphs 5b and 5c. Clean, repair and adjust as follows:

a. Remove the retaining rings and washers that are used to mount the lever assembly. Detach springs (70) and (72) and remove lever assembly. Clean and lubricate (see paragraph 7) and reassemble.

b. If pinch roller assembly (28) does not engage the flywheel and shaft assembly (129) with remote lever assembly (69) in running position, or does not disengage flywheel and shaft assembly when remote lever is in "Stop" position, adjust tab in which spring (70) is hooked so that the remote lever, when actuated to the "Stop" position causes the pinch roller to disengage the flywheel and shaft assembly with a clearance of 1/64 to 1/32 inch. Release remote lever assembly and make sure that the tab on the remote lever clears the pinch roller lever assembly (32).

16. SPEED SELECTOR OR EQUALIZER SWITCH INOPERATIVE

a. If the "Speed Selector" is out of adjustment, disassembly equipment as covered in paragraphs 5b and 5c, and clean, repair or replace as necessary. Broken or unhooked springs (87 or 95) on drive idler assemblies or cam shaft assembly (90) being out of adjustment would be the chief causes of faulty operation. Check to see that the follower pins on the ends of the lever and idler assemblies (89) and (96) drop into the recesses on the cam shaft assembly (90) when the shaft is turned to its two different positions. Adjustment is made by loosening the set screws (55 & 56) in switch cam (54) and turning cam shaft assembly (90) as required.

b. Failure of the "Equalizer Switches" (M4 & M5) may be due to the switch cam assembly (54) being loose on the cam shaft assembly (90). To adjust, turn cam shaft assembly to "off" position and set arms of switch cam assembly the same distance from equalization switch (M4). Tighten set screws (55 & 56) in this position. Check to see that mechanical linkage from (M4) to (M5) is intact.

17. PROPER ACTION OF THE AUTOMATIC "TAPE-OFF" SWITCH

Model 270 and 280 Ekotapes employ an automatic switch (M8, "Tape-Off" switch) which stops the motor (137) when tape runs out in either "Rewind" or "Forward" positions. This action is accomplished by use of switch (M8) being held in the closed position by the tape (motor running). When tape runs "out", the switch drops into "open" position, stopping the motor. This is a precision switch, and proper adjustment is important whenever the switch is replaced or the switch does not function properly.

If replacement is necessary, order the complete switch and bracket assembly (Item 46 on Exploded View) Part No. 242-24018. This assembly is pre-adjusted before shipment; however, it is still advisable to check proper action before installation. Correct action is such that as the plastic arm is moved to the "closed" position, and just as the switch snaps, the arm should be vertical to the bracket. If this is not the case the arm should be bent so proper action is developed. Use a long nose pliers, bending at the metal section of the arm as shown in illustration (A).

To check the pre-adjustment, fasten switch to mechanism plate by means of two screws (47), threading

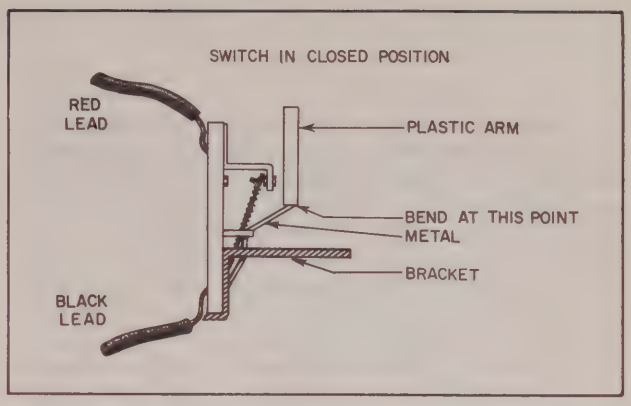


Illustration (A). "Tape-Off" Switch Adjustment

leads per original. Be sure to solder black lead to terminal strip directly under 5Y3 tube (V7) socket and red lead to bottom pin on A.C. receptacle (M14). Then hold bracket and switch in the extreme position away from guide post, and turn screws (47) "in" just enough to hold bracket in place; note position of switch arm as unit is indexed to "Play" position. If arm hangs "up", move the bracket so that plastic arm falls into the guide post. Then note action of arm when tape runs "out" in both "Forward" and "Rewind" positions. The arm should now be centered so that the arm will fall into the post in either "Rewind" or "Forward" position when tape runs "out". Proper setting of arm to post is made by moving switch and bracket slightly as needed. After adjustment, tighten the two screws.

After the above adjustment is made, place the recorder in "Forward" position without tape, and the motor should remain "off". If the motor still runs, the switch is not in the "open" position and the metal bracket should be bent downwards until the switch moves to "open" and motor remains "off". Bracket can be bent by use of a screw driver set on top of it, slightly tapping the screw driver handle with the hand. The switch action is correct when the arm moves into post and snaps into "open" about 1/32 of an inch before coming to rest on the post. If this position is set too far away, the switch will open in the "Rewind" position and at times even in the "Forward" position.

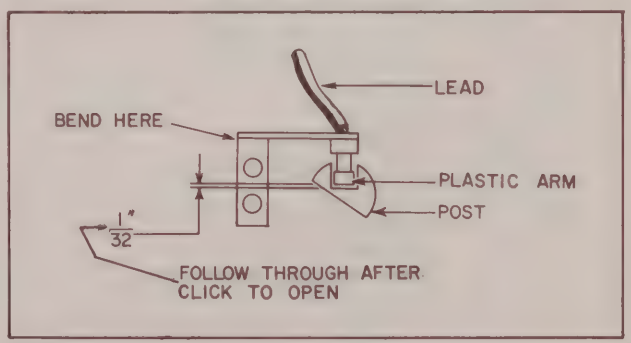


Illustration (B). "Tape-Off" Switch Adjustment

After above settings have been made, a final operating check should be made to be sure that pressures on the switch leads in assembly has not disrupted the settings.

Many of the parts of the recorder are indicated on the illustrations with the reference numbers in the parts list. It is preferable to replace complete sub-assemblies from the standpoint of saving time on repairs and for better performance after repair. When ordering parts always refer to the model and serial number on nameplate for which parts are required. The nameplate for Model 270 is located inside on left hand panel of carrying case (in storage compartment). In Model 280 nameplate is located on storage compartment hinged door.

a. The list is separated into three columns: Ref. No., Part No., and Description. The Ref. No. column has a number which is assigned in numerical order of appearance of the part. The Description column gives the part name.

b. When ordering a part, include the Ref. No. from the first column, the Part No., and the Description.

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description
1	241-24064	Knob
2	242-24068	Knob Assembly
3	242-24066	Knob Assembly
4	241-15116	Set Screw, Knob
5	241-20433-3	Cover, Plastic
6	241-24061	Top Panel (Used on 280 Series Only)
7	29529-69	Phillips Pan Hd. Mach. Screw (Used on 280 Series only)
7A	29529-70	Screw, #4 - 40 x 5/16
8	29602-111	Washer (Used on 280 Series Only)
9	29529-27	Phillips Pan Hd. Mach. Screw
10	241-20434-4	Head Cover, Plastic
11	242-17761	Reel Shaft Assembly
12	242-17771-5	Reel Shaft Assembly
13	241-17770	Washer
14	241-17814-7	Top Panel (For 270 Series)
	242-24059	Screen Panel Assembly (For 280 Series)
15	29529-68	Phillips Pan Hd. Mach. Screw.
16	29602-111	Washer
17	242-24041	Bracket & Bushing Ass'y.
18	241-16306	Sems Fastener
19	242-24038	Gear & Shaft Ass'y.
20	29650-1	Retaining Ring
21	241-17723	Washer, Spring Tension
22	241-17722	Washer
23	242-24030	Cam & Plate Ass'y.
23A	242-24028	Cam & Shaft Assembly
24	29540-9	Cup Point Set Screw
25	29527-4	Screw
26	29602-103	Washer
27	241-17747	Washer
28	242-17744	Pinch Roller Assembly
29	241-17722	Washer
30	29650-1	Retaining Ring
31	241-17722	Washer
32	242-17741	Pinch Roller Lever Ass'y.
33	241-12138	Spring
34	242-17739	Follower Lever Assembly
35	241-14252	Spring
36	29650-1	Retaining Ring
37	241-17723	Spring Tension Washer
38	242-17748-5	Pressure Pad Assembly
39	241-24556	Spring
40	29651-1	Retaining Ring
41	242-24024	Kickout Lever Ass'y.
42	241-24027	Spring

Ref. No.	Part No.	Description
43	29525-6	#4-40 x 3/8 Phillips Flat Hd. Mach. Screw
44	242-24046	Head & Can Ass'y.
45	241-24075	Head Mtg. Spring
46	242-24018	Switch & Bracket Ass'y.
47	241-18841	#4 - 40 x 3/16" Pan Hd. Sems Fastener
48	29651-1	Retaining Ring
49	241-12059	Spring Tension Washer
50	29602-154	Washer
51	241-24023	Slide Lever
52	29602-154	Washer
53	241-17734	Spring
54	242-17728	Switch Cam Ass'y.
55	29540-9	Cup Pt. Set Screw
56	29542-5	Cone Pt. Set Screw
57	29527-13	#4 - 40 x 1/2" Rd. Hd. Mach. Screw
58	241-17754	Top, Tape Guide
59	241-17753	Spacer, Tape Guide
60	241-17752	Shelf, Tape Guide
61	242-17713-4	Index & Interlock Lever Ass'y.
62	241-21906	Spring
63	241-20477-1	Counter
64	241-17886	#6 - 32 x 3/16" Sems Fastener
65	241-20478	Bracket
66	29651-1	Retaining Ring
67	241-12059	Spring Tension Washer
68	29602-124	Washer
69	242-17755	Remote Lever Ass'y.
70	241-17734	Spring
71	242-17758-3	Brake Lever Ass'y
72	241-17734	Spring
73	242-17758-3	Brake Lever Assembly
74	29651-4	Retaining Ring
75	241-12059	Spring Tension Washer
76	242-17683-9	Mechanism Plate Ass'y.
77	242-17695-3	Reel Shaft Support Ass'y. (left)
78	241-17802-1	Spring
79	241-17801	Spring
80	242-17703-4	Reel Shaft Support Ass'y. (right)
81	241-17770	Washer
82	29650-2	Retaining Ring
83	29602-124	Washer
84	241-12059	Spring Tension Washer
85	29651-4	Retaining Ring
86	241-17770	Washer
87	241-17802	Spring

Ref. No.	Part No.	Description
88	241-17735	Idler Link
89	241-17733	Follower Lever
90	242-17724-2	Cam Shaft Ass'y.
91	242-17719-3	Idler Assembly
92	29650-1	Retaining Ring
93	241-17722-1	Washer
94	242-17719-3	Idler Assembly
95	241-17802	Spring
96	241-17735	Idler Link
97	241-17733	Follower Lever
98	241-17723	Spring Tension Washer
99	29650-1	Retaining Ring
100	242-17766	Reel Pulley Assembly
101	29540-9	Set Screw, Cup Point
102	241-20481	Belt
103	241-20479	Pulley
104	241-17775	Washer
105	241-17086-4	Pin
106	241-17777	Clutch Disc.
107	29650-2	Retaining Ring
108	242-17773	Reel Pulley Assembly
109	241-20551	Fibre Washer
110	29602-102	Washer
111	241-176-44	Spring
112	241-17799-1	Self Locking Wing Nut
113	241-17717	Idler Link

Ref. No.	Part No.	Description
114	241-17723	Spring Tension Washer
115	29650-1	Retaining Ring
116	241-17722-1	Washer
117	242-17719-3	Idler Assembly
118	241-17722-1	Washer
119	29650-1	Retaining Ring
120	241-20480	Pulley
121	29540-1	Cup Point Set Screw
122	29650-6	Retaining Ring
123	241-17795	Spring Tension Washer
124	241-17794	Washer
125	242-17791	Clutch Disc Ass'y.
126	241-17793	Motor Pulley Clutch Disc.
127	241-17789-2	Motor Pulley.
128	29540-9	Cup Point Set Screw
129	242-17778-1	Flywheel & Shaft Ass'y.
130	241-13609	Ball
131	241-16306	#8 - 32 x 1/4 Sems Fastener
132	242-17765-3	Support Plate Ass'y.
133	241-17787	Shock Mount
134	241-17763	Washer
135	241-17827	#10 - 32 x 11/16" Sems Fastener
136	241-17786-3	Motor Mounting Plate
137	241-20800	Motor
138	241-14134	Fan

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Playback Preamp.	5879	
V2	AF Amp.	12AX7	
V3	AF Amp-Phase Inv.	12AX7	
V4	Output	6AQ5	
V5	Output	6AQ5	
V6	Bias Osc.	6AQ5	
V7	Rectifier	5Y3GT	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	Ekotape PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	450	241-14236	AFH2-57	B0450	FP238	TMD-54	D-235	TVL-2764
B	▲40	450							
C2A	▲40	450	241-14238	AFH3-134	C1080	FP369.1	TMT-134	T-685	TVL-3744.2
B	■40	450							
C	▲40	25							
C3	50	6	S6063	SRE6V50	BBR50-6	TT6X50	TD-50-6	MMT-650	TVA-1100

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	Ekotape PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C4	200		S6065-3	SI200	D6-201	LT6T2	UC-532	5GA-T2	
C5	.1	400	S3595	P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	
C6	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C7	.005	600	S4512	P688N-005	D6-502	CUB6D5	GEM-625	6TM-D5	
C8	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C9	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C10	.002	600	S4510	P688N-002	D6-202	CUB6D2	GEM-622	6TM-D2	
C11	.05	200	211-14912	P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5	
C12	3000		211-19827						2%
C13	300		211-19833						2%
C14	.025	400	S4282	P488N-025		CUB4S22	GEM-4125	4TM-S25	
C15	.025	400	S4282	P488N-025		CUB4S22	GEM-4125	4TM-S25	
C16	100		S6065-2	SI100	D6-101	LT6T1	UC-531	5GA-T1	
C17	.047	400	211-15048	P488N-047	DF-503	CUB4S47	GEM-4147	4TM-S47	
C18	1000		S6065-5	SI1000	D6-102	LT6D1	UC-521	5GA-D1	
C19	50		S6065-11	SI50	D6-500	LT6Q5	UC-545	5GA-Q5	
C20	50		S6065-11	SI50	D6-500	LT6Q5	UC-545	5GA-Q5	
C21	100		S6065-2	SI100	D6-101	LT6T1	UC-531	5GA-T1	
C22	3000		241-14260-1	SI3000	D6-302	LT6D3	UC-523	5GA-D3	
C23	1700		241-14260-2						
C24	3000		241-14260-1	SI3000	D6-302	LT6D3	UC-523	5GA-D3	
C25	.75	50							
C26	.1	400	211-13083	P488N-1	DF-104	CUB4P1	GEM-411	4TM-P1	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	Ekotape PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	½	241-17940-2	B-60	A47-500K-Z	Q13-133	U48	Volume
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R2	100K-250K	½	241-17941-1					Tone Note 1.

Note 1. Tone control element is open at center of range.

PARTS LIST & DESCRIPTION (continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		Ekotape PART No.	NOTES
	OHMS	WATT		
R3	510K		29501-53	
R4	1000Ω		29501-11	
R5	1meg		29501-57	
R6	150K		29501-44	
R7	510K		29501-53	
R8	10K		29501-24	
R9	22K		29501-29	
R10	2000Ω		29501-14	
R11	100K		29501-41	
R12	180K		29501-46	
R13	240K		29501-48	
R14	2000Ω		29501-14	
R15	100K		29501-41	
R16	100K		29501-41	
R17	100K		29501-41	
R18	5100Ω		29501-21	
R19	1meg		29501-57	
R20	150K		29501-44	
R21	390K		29501-113	
R22	5100Ω	1	29501-75	
R23	2400Ω		29501-15	
R24	2000Ω		29501-14	
R25	240K		29501-48	
R26	240K		29501-48	
R27	360K		29501-50	
R28	12K		29501-25	
R29	360K		29501-50	
R30	240Ω	2	29501-90	
R31	30K		29501-32	
R32	470K		29501-52	
R33	430Ω		29501-137	
R34	8Ω	4	241-21803	Nichrome
R35	10K	1	29501-76	

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	Ekotape PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117VAC @.59A	540VCT @.080A	5VAC @1.8A	242-21908 242-22170 ①	P9206			PC8404	24R13U	R-10A
	SEC. 3	SEC. 4	SEC. 5							
	6.3VCT @2A									

① Used in Models 271, 281

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	Ekotape PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	5500Ω CT	3-4Ω	242-21783-1	Z1011 ①	A-2935 ①	AU-609①	A-3870①	22S58①	S-55X①	① Use original shields.

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	Ekotape PART No.	QUAM PART No.	
SP1	6" x 9"	PM	3-4Ω	241-22482 69HB-3 ②	69A3	① Used in parallel with SP1 in Model 280 only. ② Alternate Part
SP2	3"	PM	16Ω	241-22481①		

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		Ekotape PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	Bias Osc.	241-14246-1					

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA						
	CURRENT (Measured)	DC RES.	INDUCTANCE (0 CURRENT 1000 ~)	Ekotape PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L2	.080A	130Ω	5.5HY	242-21787	C5012①			C-1709	20C65①	C-14A①

① Drill New Mounting Hole

PARTS LIST AND DESCRIPTIONS (Continued)

CRYSTAL DIODES

ITEM No.	ORIG. TYPE	REPLACEMENT DATA			NOTES
		Ekotape PART No.	CBS PART No.	SYLVANIA PART No.	
M1	IN65	211-19988	IN65	IN38A	Meter Rect. (Pigtail)

MISCELLANEOUS

ITEM No.	PART NAME	Ekotape PART No.	NOTES
M2	Record-Playback Head	242-24046	
M3	Lamp	241-22717	#1847
M4	Switch	241-17945-7	Selector, Rotary Wafer Type
M5	Switch	241-21802-1	Speed Equalization, SPDT, Slide Type
M6	Switch	241-21804	Muting
M7	Switch	241-17942-2	Speaker, On-Off, Rotary Wafer Type
M8	Switch	241-24021	Tape-Off
M9	Meter	24-24210	Record Level Meter
M10	Jack	241-12180-2	Play-Record Head Output
M11	Jack	84324	Mike Input
M12	Jack	84323	Radio-Phono Input
M13	Jack	84324	External Speaker
M14	Plug	241-24062	AC, Recessed
M15	Outlet	241-15098	AC, Model 280 only
M16	Motor	241-20800	

CABINETS & CABINET PARTS

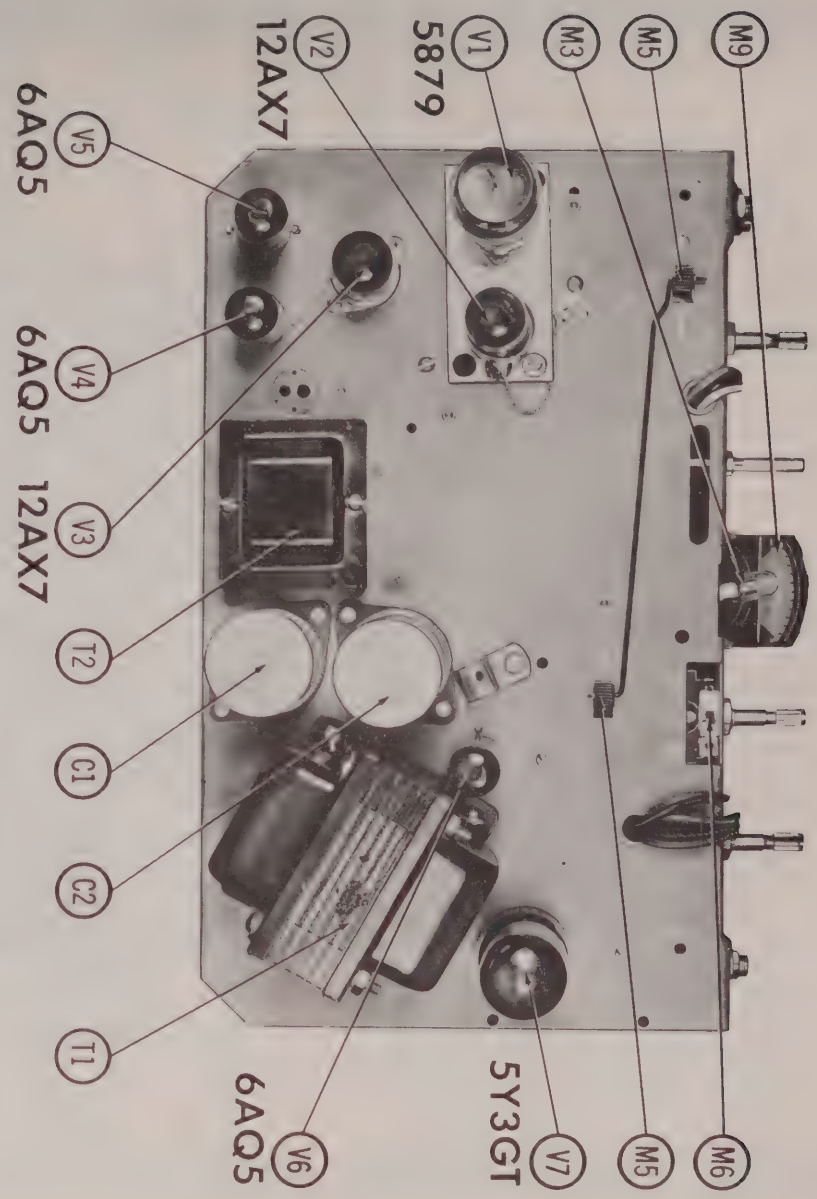
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	241-24064	
Knob	242-24068	Assembly
Knob	242-24066	Assembly
Cover	241-20433-3	
Cover	241-20434-4	Head
Panel	241-24061	Top, 280 Series only
Panel	241-17814-7	Top, 270 Series only

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

CHASSIS— TOP VIEW



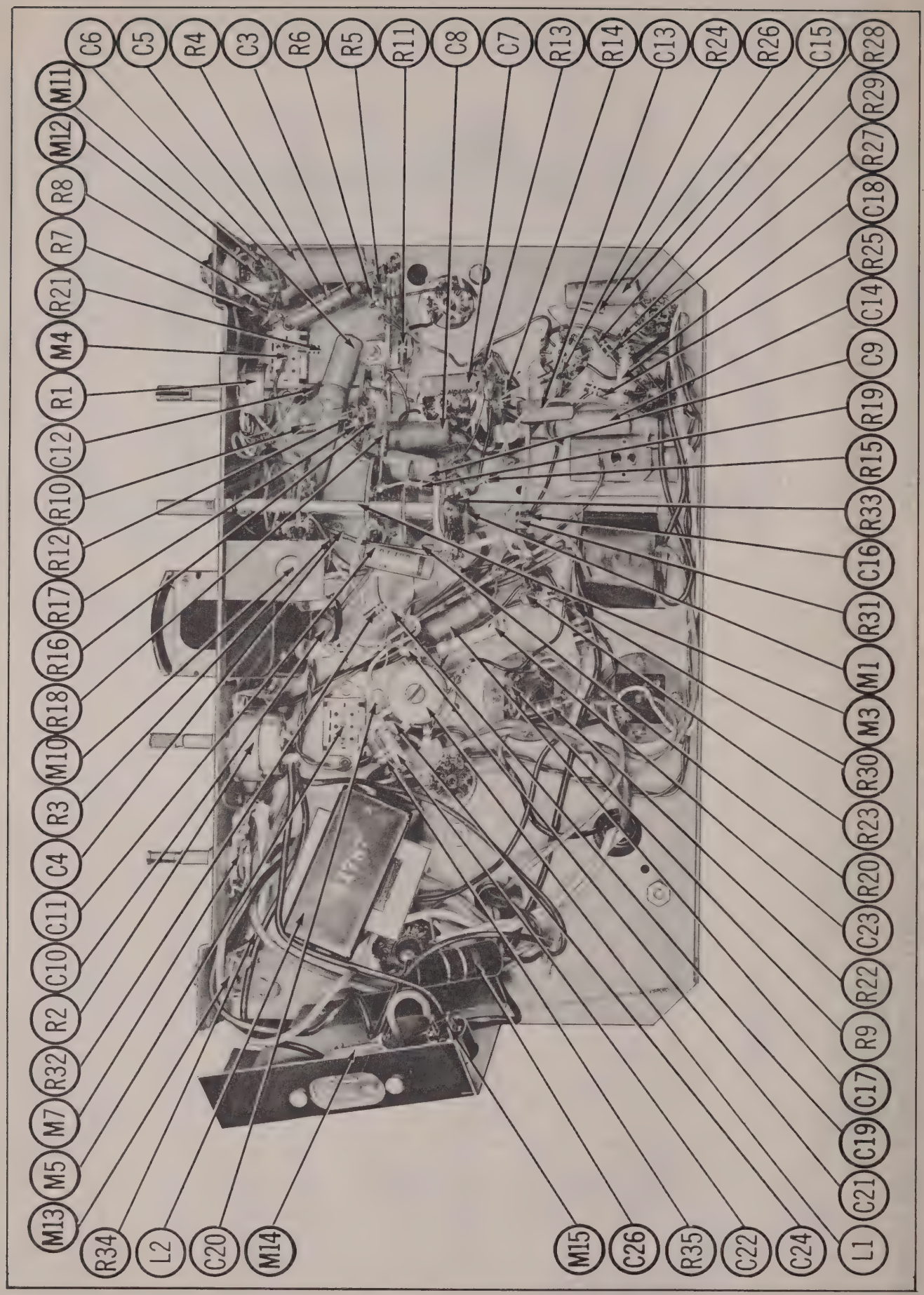
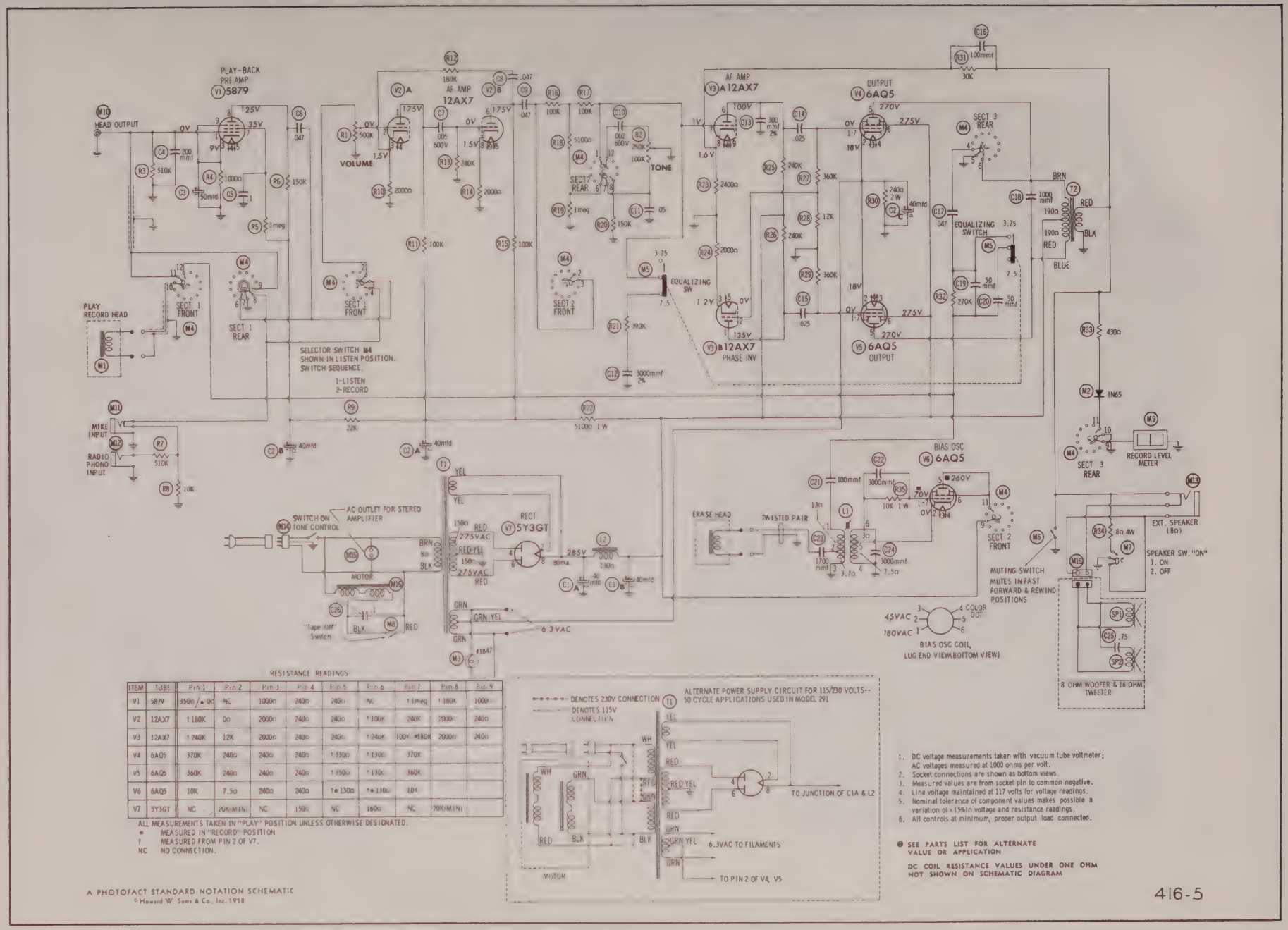


Figure 8. Bottom View Of Amplifier Assembly



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	5879	350Ω/●.0Ω	NC	1000Ω	240Ω	240Ω	NC	†1meg	†180K	1000Ω
V2	12AX7	†180K	0Ω	2000Ω	240Ω	240Ω	†100K	240K	2000Ω	240Ω
V3	12AX7	†240K	12K	2000Ω	240Ω	240Ω	†24M	100K	†180K	2000Ω	240Ω
V4	6AQ5	370K	240Ω	240Ω	240Ω	†330Ω	†130Ω	370K		
V5	6AQ5	360K	240Ω	240Ω	240Ω	†350Ω	†130Ω	360K		
V6	6AQ5	10K	7.5Ω	240Ω	240Ω	†=130Ω	†=130Ω	10K		
V7	5Y3GT	NC	20K(MIN)	NC	150Ω	NC	160Ω	NC	20K(MIN)	

ALL MEASUREMENTS TAKEN IN "PLAY" POSITION UNLESS OTHERWISE DESIGNATED.
● MEASURED IN "RECORD" POSITION
† MEASURED FROM PIN 2 OF V7.
NC NO CONNECTION.

DENOTES 230V CONNECTION
DENOTES 115V CONNECTION

ALTERNATE POWER SUPPLY CIRCUIT FOR 115/230 VOLTS--50 CYCLE APPLICATIONS USED IN MODEL 291

TO JUNCTION OF C1A & L2
6.3VAC TO FILAMENTS
TO PIN 2 OF V4, V5

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ±15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC
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416-5

Figure 9. Schematic Diagram

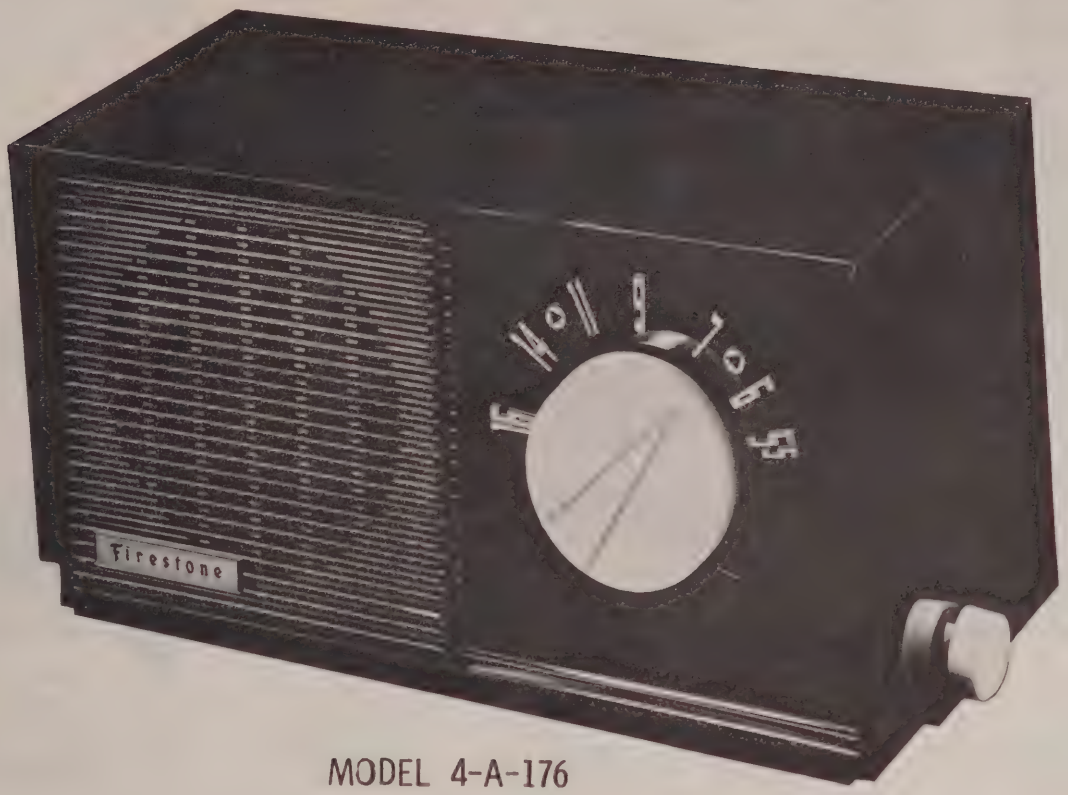
PHOTOFACT* Folder

*TRADE MARK

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

FIRESTONE MODELS 4-A-176, 4-A-178 (Codes 1-7-4C3, 1-7-4T4)

FIRESTONE MODELS 4-A-176, 4-A-178 (Codes 1-7-4C3, 1-7-4T4)



MODEL 4-A-176

FIRESTONE MODELS 4-A-176, 4-A-178 (Codes 1-7-4C3, 1-7-4T4)

TRADE NAME	Firestone Models 4-A-176 (Code 1-7-4T4), 4-A-178 (Code 1-7-4C3)
SUPPLIER	Firestone Tire & Rubber Co., 1200 Firestone Parkway, Akron, Ohio
TYPE SET	AC Operated AM Receiver (Model 4-A-178 is Clock Version)
TUBES (Four)	Types 12AU6 Converter, 12AV6 Det.-AF Amp., 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-125 Volts AC-60 Cycles — RATING .26 Amp. @ 117 Volts AC (24 Watts)
TUNING RANGE—BROADCAST	540-1620KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS--READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Use isolation transformer, if available. If not, connect a .1mfd capacitor in series with low side of signal generator and B-. Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1mfd	High side to pin 1 (grid) of 12AU6 (V1). Low side to chassis.	455KC (400~ Mod)	Tuning gang fully open	Across voice coil	A1, A2	Adjust for maximum output. If isolation transformer is not used, reduce dummy antenna to .001mfd to reduce hum modulation.
2.	"	"	1620KC	"	"	A3	"
3.	Direct	Loop	1400KC	Tune to 1400KC signal	"	A4	Fashion loop of several turns of wire and radiate signal into loop of receiver. Adjust for maximum output.

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The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1958 Howard W. Sams & Co., Inc., Indianapolis 5, Indiana. Printed in U.S. of America

H538

SET 416 FOLDER 6

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	Converter	12AU6	
V2	Det. - AF Amp.	12AV6	
V3	Output	50C5	
V4	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	FIRESTONE PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	150	583023	PRS150V4040	BBRT44215	TCT3116	TDLT-4	FMT-315	R1110 *
B	40	150		20					
C	20	150							

* Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	FIRESTONE PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	50			SI 50	D6-500	LT6Q5	UC-545	5GA-Q5	
C3	10		515012						
C4	.01	600		P688N-01	D6-103	CUB6S1	GEM-611	6TM-S1	
C5	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C6	.1	400		P488N-1	DF-104	CUB4P1	GEM-401	4TM-P1	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	FIRESTONE PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1meg	1/2	360081	B-70	A47-1meg-Z	Q13-137	U53	Volume, Note 1
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
C	Switch			KB-1 or KR-1*	SWE-12	76-1	US-26	

Note 1. Control without switch used in Model 4-A-178 (Part #360080).
* Use KR on CRL "red label" controls and KB on "blue label" controls.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		FIRESTONE PART No.	NOTES
	OHMS	WATT		
R2	2.2meg			
R3	120Ω			
R4	180Ω			

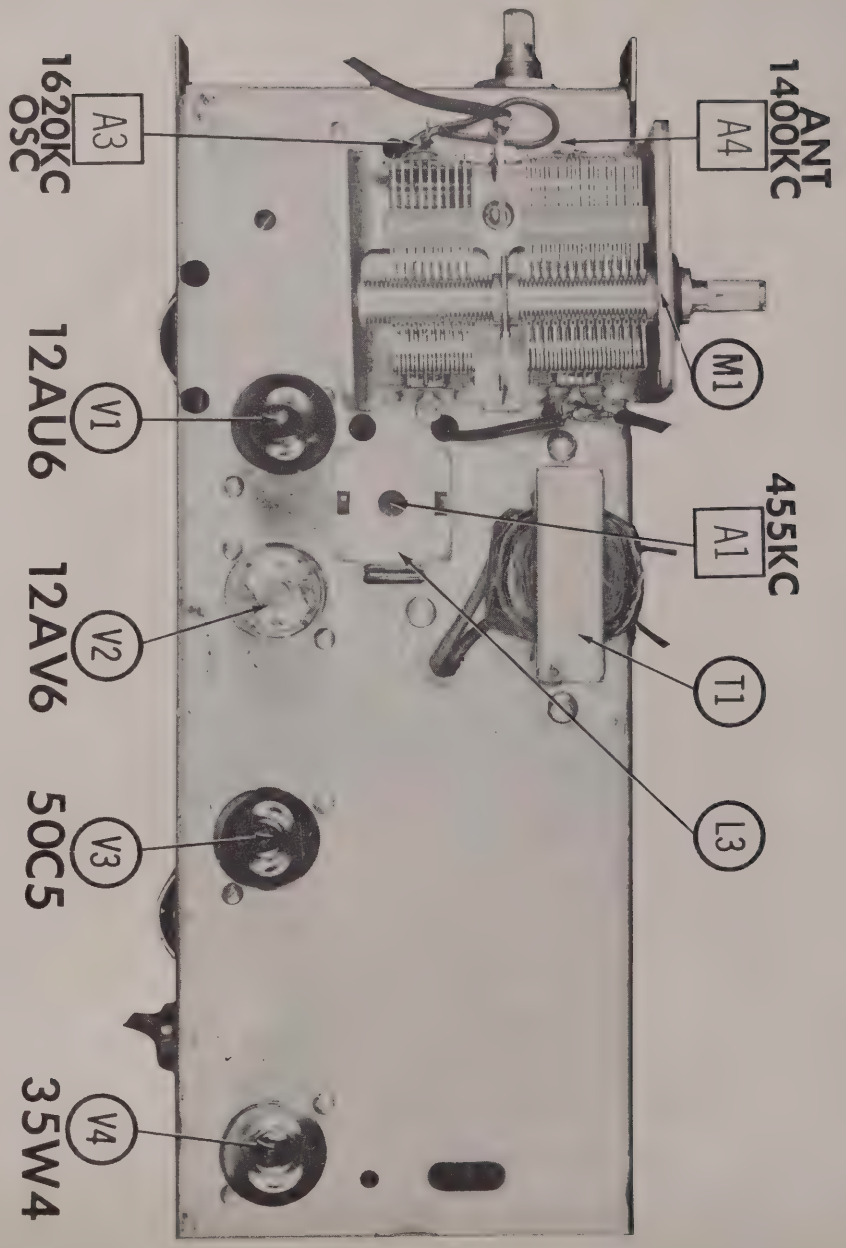
ITEM No.	RATING		FIRESTONE PART No.	NOTES
	OHMS	WATT		
R5	2200Ω	1		
R6	47Ω			

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					
		FIRESTONE PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Loop Ant.	460027					Note 1
	Loop Ant.	460028					Note 2
L2	Osc. Coil	455049					
L3	IF Trans.	450010	16-6764				

Note 1. Includes cabinet back, Model 4-A-176.
Note 2. Includes cabinet back, Model 4-A-178.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	FIRESTONE PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2200Ω	3-4Ω	430330	Z1101	A-3025	AU-605	A-3332	24S53	S-12X	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	FIRESTONE PART No.	QUAM PART No.	
SP1	4"	PM	3-4Ω	404003 ①	4A07	① Alternate Part #404006. Used in Model 4-A-176.
	4"	PM	3-4Ω	404011 ②		② Used in Model 4-A-178

COMPONENT COMBINATIONS

ITEM No.	USE	DESCRIPTION	FIRESTONE PART No.	REPLACEMENT DATA	
K1	Audio Coup. Net.	5000mmf, 250mmf, 5000mmf, 250mmf, 6.8meg, 470K, 470K	420006	Aerovox Centralab Cornell-Dubilier Sprague	PA-113-2 PC-151 116TM2 DT-2

MISCELLANEOUS

ITEM No.	PART NAME	FIRESTONE PART No.	NOTES
M1	Tuning Cap. Clock	590020 384015	2 Gang. (Ant. 34-488mmf, Osc. 22-187mmf) Dark Face, Model 4-A-178

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

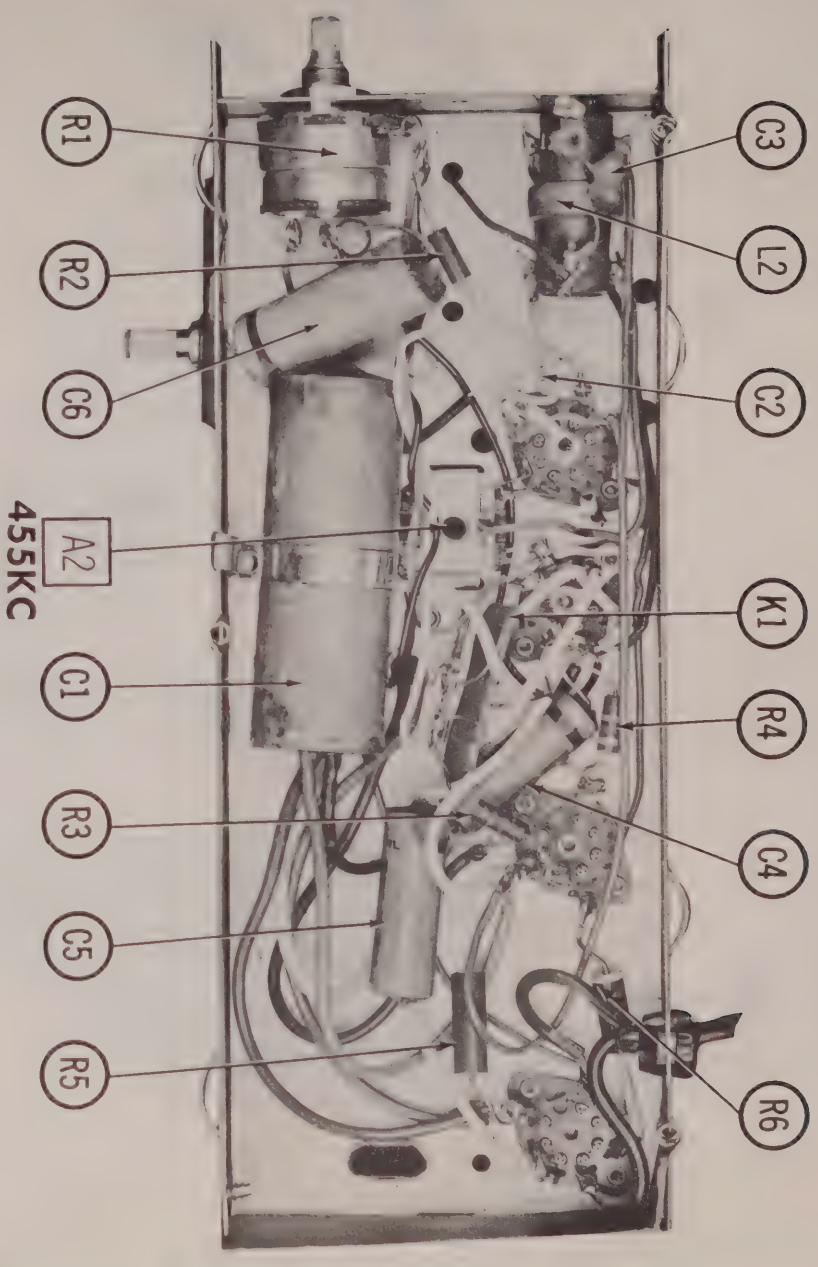
NAME	PART NO.	DESCRIPTION
Knob	271418	Tuning, Ivory, Model 4-A-176
Knob	272225	Tuning, White, Model 4-A-178
Knob	272226	Tuning, Pink, Model 4-A-178
Knob	271004	Volume, Ivory, Model 4-A-176
Knob	272227	Volume, White, Model 4-A-178
Knob	272228	Volume, Pink, Model 4-A-178
Knob	272224	Clock, Model 4-A-178
Cabinet	250064	Walnut, Model 4-A-176
Cabinet	250150	White, Model 4-A-178
Cabinet	250151	Pink, Model 4-A-178
Clock Crystal	260015	Model 4-A-178

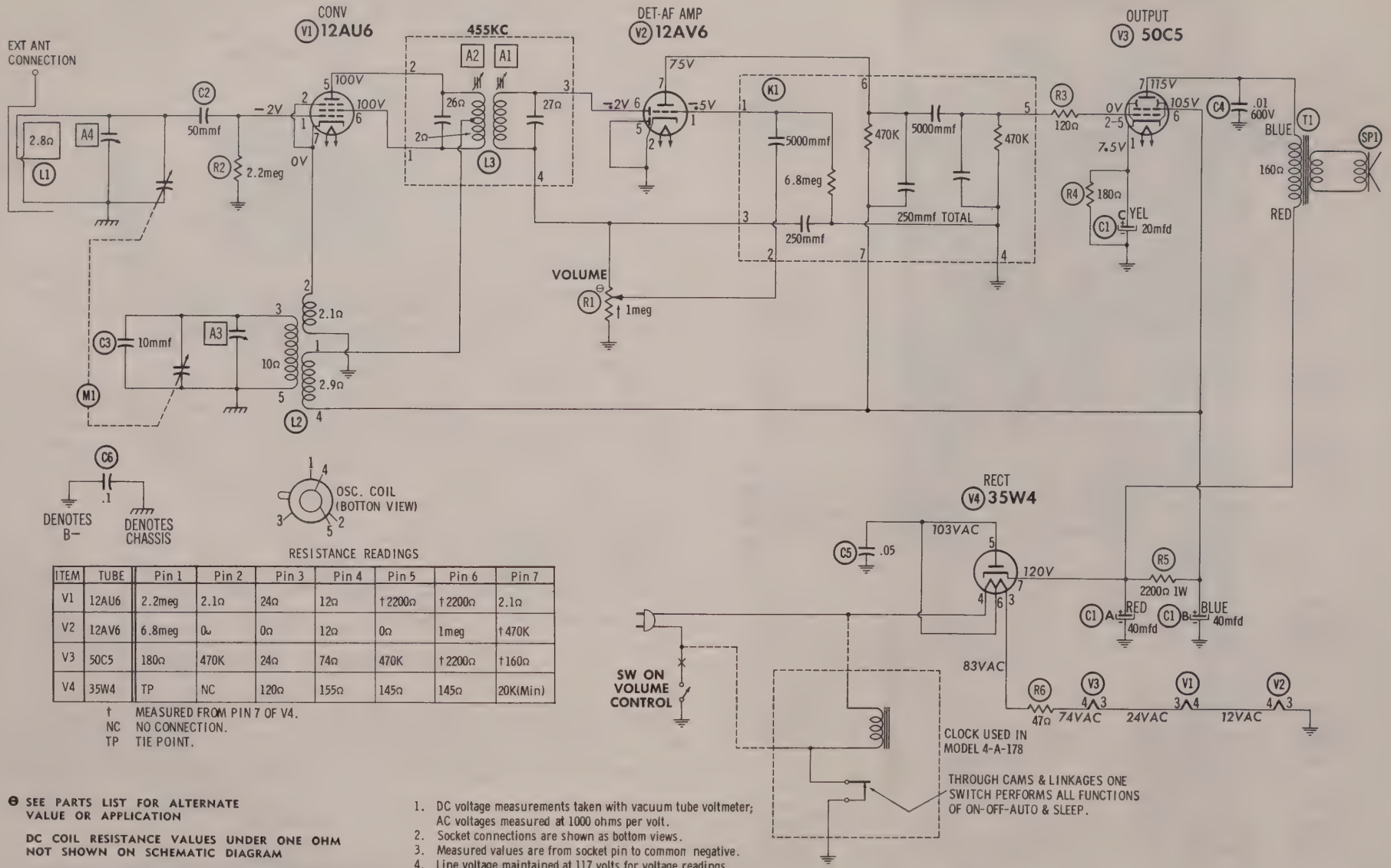
WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

CHASSIS—BOTTOM VIEW





RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7
V1	12AU6	2.2meg	2.1Ω	24Ω	12Ω	†2200Ω	†2200Ω	2.1Ω
V2	12AV6	6.8meg	0Ω	0Ω	12Ω	0Ω	1meg	†470K
V3	50C5	180Ω	470K	24Ω	74Ω	470K	†2200Ω	†160Ω
V4	35W4	TP	NC	120Ω	155Ω	145Ω	145Ω	20K(Min)

† MEASURED FROM PIN 7 OF V4.
NC NO CONNECTION.
TP TIE POINT.

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

A PHOTOFACT STANDARD NOTATION SCHEMATIC
Howard W. Sams & Co., Inc. 1958

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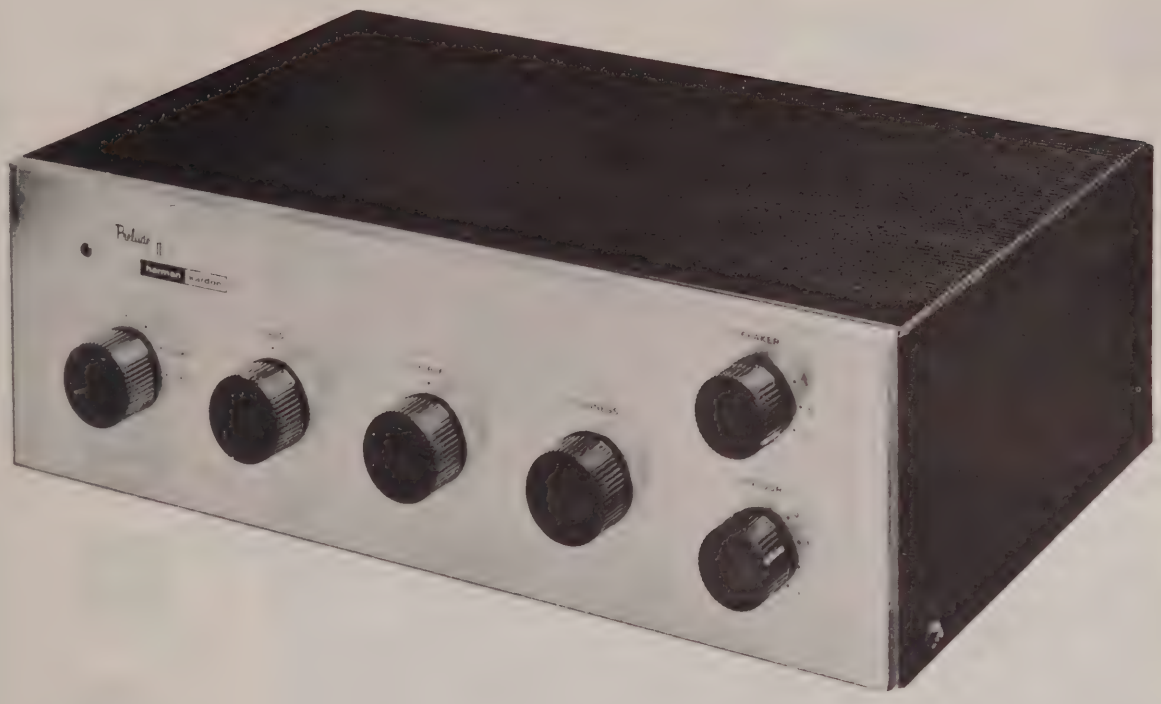
with CIRCUITRACE*

HARMAN-KARDON
MODEL A-12 (Prelude II)

HARMAN-KARDON
MODEL A-12 (Prelude II)



HARMAN-KARDON
MODEL A-12 (Prelude II)

TRADE NAME	Harman-Kardon Model A-12 "Prelude II"
MANUFACTURER	Harman-Kardon Inc., 520 Main St., Westbury, Long Island, N. Y.
TYPE SET	AC Operated Audio Amplifier
TUBES (Six)	Types ECC83/12AX7 Preamplifier, 6AU6 AF Amplifier, 6C4 Phase Inverter, (2) EL84/6BQ5 Output, EZ81/6CA4 Rectifier
POWER SUPPLY	105-125 Volts AC - 50/60 Cycles RATING .72 Amp. @ 117 Volts AC (72 Watts)

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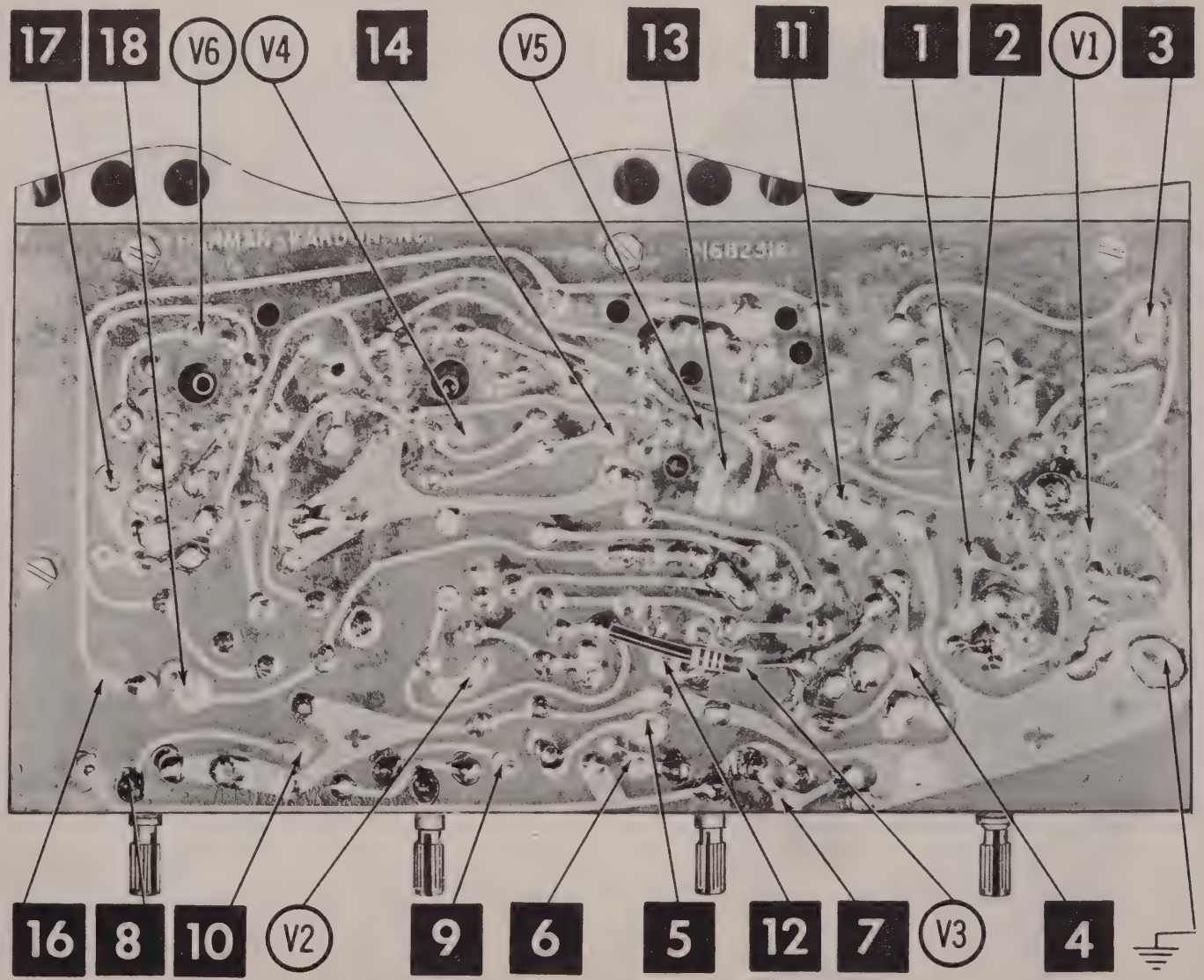
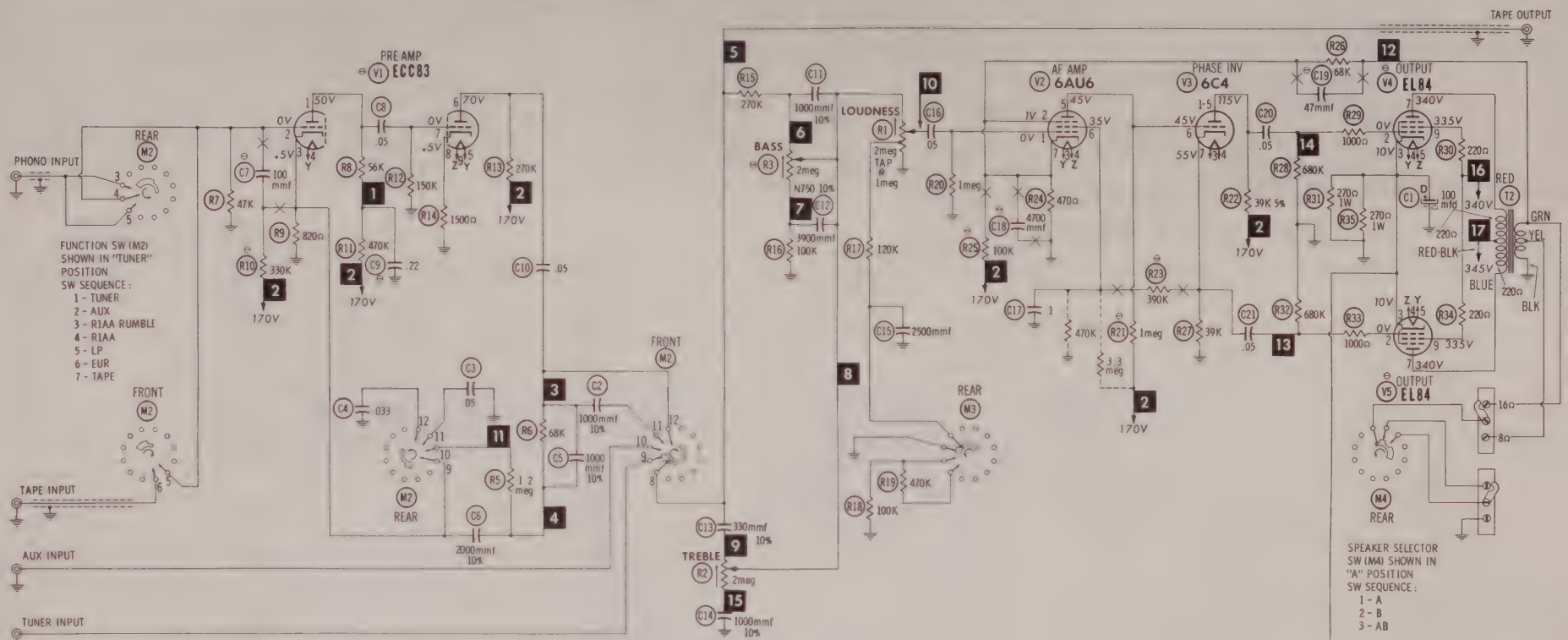
SET 416 FOLDER 7



A Howard W. Sams CIRCUITRACE* Photo
*TRADE MARK

PRINTED BOARD

ARROWS INDICATING TUBE LOCATIONS ARE POINTING TO PIN 1 UNLESS OTHERWISE INDICATED



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	ECC83 12AX7	† 560K	47K	820Ω	160Ω	160Ω	† 300K	150K	1500Ω	160Ω
V2	6AU6	1meg	470Ω	160Ω	160Ω	† 1meg	430K	470Ω		
V3	6C4	† 70K	† 1meg	160Ω	160Ω	† 70K	† 1meg	39K		
V4	EL84 6BQ5	680K	680K	120Ω	160Ω	160Ω	NC	† 220Ω	NC	† 1200Ω
V5	EL84 6BQ5	680K	680K	120Ω	160Ω	160Ω	NC	† 220Ω	NC	† 1200Ω
V6	EZ81 6CA4	120Ω	NC	¶	160Ω	160Ω	NC	120Ω	NC	NC

¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.
† MEASURED FROM PIN 3 OF V6
NC NO CONNECTION

Θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

A PHOTOFACT STANDARD NOTATION SCHEMATIC with CIRCUITRACE®

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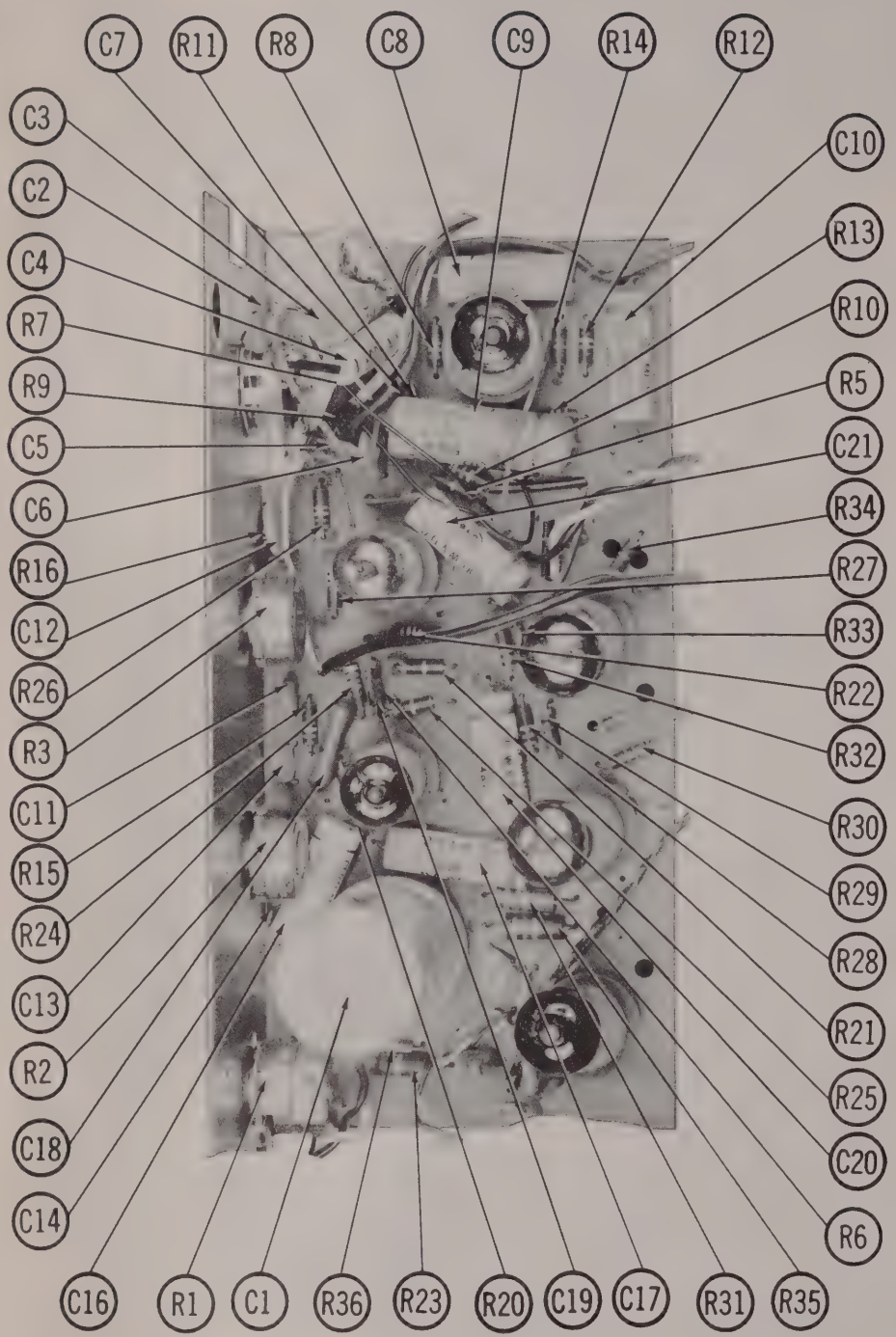
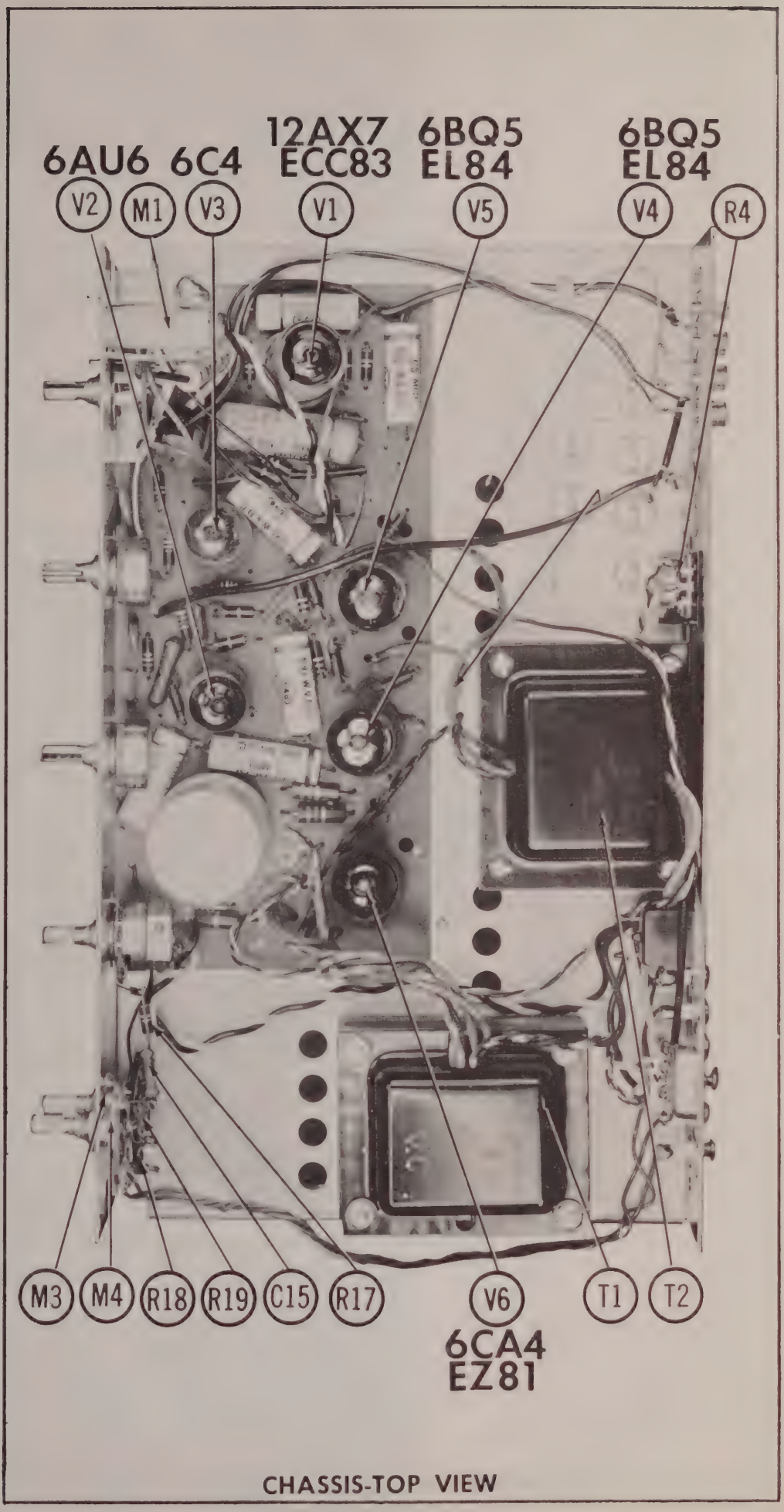
1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance of component values makes possible a variation of ± 15% in voltage and resistance readings.
6. All controls at minimum, proper output load connected.



PRINTED BOARD TOP VIEW



CHASSIS-TOP VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE
V1	Preamplifier	ECC83/12AX7 ①
V2	AF Amplifier	6AU6
V3	Phase Inverter	6C4
V4	Output	EL84/6BQ5 ①
V5	Output	EL84/6BQ5 ①
V6	Rectifier	EZ81/6CA4 ①

① Domestic type listed may not be directly interchangeable in some instances.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA Harman-Kardon PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	40	350	JE621281						PCL-4627
B	▲20	350							
C	■10	350							
D	▲100	50							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA Harman-Kardon PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C2	1000					1R5D1		MS-21	10%
C3	.05	200		P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5	
C4	.033	200		P288N-033	DF-303	CUB6S33	GEM-4133	4TM-S33	
C5	1000					1R5D1		MS-21	10%
C6	2000					1R5D2		MS-22	10%
C7	100			BPD-0001	DD-101	L10T1	UC-531	5GA-T1	Note 2
C8	.05	200		P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5	
C9	.22	200		P288N-22		CUB2P22	GEM-2022	2TM-P22	Note 1
C10	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C11	1000					1R5D1		MS-21	10%
C12	3900								10% N750
C13	330					5R5T33		MS-333	10%
C14	1000					1R5D1		MS-21	10%
C15	2500			SI 2500	D6-252	LT6D25	UC-5225	5GA-D25	
C16	.05	200		P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5	
C17	.1	200		P288N-1	DF-104	CUB2P1	GEM-201	2TM-P1	
C18	4700			SI 4700	D6-472	LT6D47	UC-5247	5GA-D47	Note 2
C19	47			BPD-000047	DD-470	L10Q47	UC-5447	5GA-Q47	Note 2
C20	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	
C21	.05	400		P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	

Note 1. Some versions may use .05mfd in this application.
Note 2. Not used in some versions.

CONTROLS

ITEM No.	RATING RESISTANCE	RATING WATTS	REPLACEMENT DATA Harman-Kardon PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	INSTALLATION NOTES
R1A	2meg	½	RV1682328	BT-78	A47F3-2meg	Q18-139X	UT-451	Loudness, Tap ② 1meg
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
C	Switch			KB-1 or KR-1*	SWE-12	76-1	US-26	
R2A	2meg	½	RV1682329	B-70	A47-2meg-Z	Q13-139	U55	Treble
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R3A	2meg	½	RV1682329	B-70	A47-2meg-Z	Q13-139	U55	Bass Note 1
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R4	100Ω	½	RVCOM2411					Hum Adj.

Note 1. Part #RV1682330 used in some versions.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	Harman-Kardon PART No.	NOTES
R5	1.2meg			
R6	68K			
R7	47K			
R8	56K			
R9	820Ω			
R10	330K			Note 1
R11	470K			
R12	150K			
R13	270K			
R14	1500Ω			
R15	270K			
R16	100K			
R17	120K			
R18	100K			
R19	470K			
R20	1meg			
R21	1meg			Note 2
R22	39K 5%			
R23	390K			Note 1
R24	470Ω			
R25	100K			Note 1
R26	68K			
R27	39K			
R28	680K			
R29	1000Ω			
R30	220Ω			
R31	270Ω	1		
R32	680K			
R33	1000Ω			
R34	220Ω			
R35	270Ω	1		
R36	33K			
R37	1000Ω	1		

Note 1. Not used in some versions.
Note 2. Some versions may use 1.2meg in this application.

TRANSFORMER (POWER)

ITEM No.	RATING PRI.	RATING SEC. 1	RATING SEC. 2	REPLACEMENT DATA Harman-Kardon PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V ② .72A	560VCT ② .110A	6.3V ② 3.3A	FT1682333		P-3048				

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA Harman-Kardon PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	6500Ω CT	16Ω Tap ② 8Ω	FT1682336					22S97 ①	S-35A ①	① Use original shields.

MISCELLANEOUS

ITEM No.	PART NAME	Harman-Kardon PART No.	NOTES
M1	Lamp		#51
M2	Switch	ER1682338	Function
M3	Switch	ER1682332	Contour
M4	Switch	ER1682331	Speaker Selector
	Printed Board	P1682318	

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	P22783	Small, two used.
Knob	P20778	Four used.
Cage	P1672214	

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

PHOTOFACT* Folder

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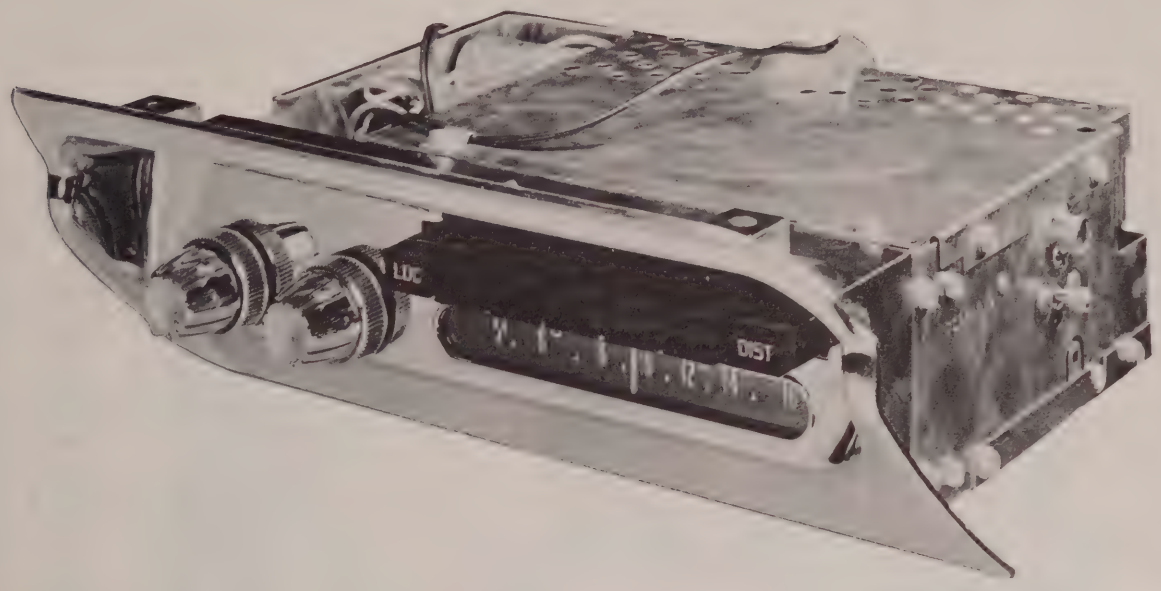
MOPAR MODEL 925 (P-5803)



TRADE NAME	Mopar Model 925 (P-5803) For 1958 LP1 & LP2 Plymouth Automobiles
MANUFACTURER	Philco Corp., Tioga & "C" Streets, Philadelphia, Pa.
TYPE SET	Battery Operated Custom Built AM Automobile Receiver With Transistorized Output
TUBES (Five)	Types 12BL6 RF Amplifier, 12AD6 Converter, 12CX6 (or) 12BL6 IF Amplifier, 12DL8 Det.-AVC-Driver, 12U7 Trigger-AF Amplifier
POWER SUPPLY	12 Volt Storage Battery — RATING 1.2 Amp. @ 12.6 Volts DC
TUNING RANGE—BROADCAST	540 - 1610KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.047mfd	High side to pin 7 (grid) of 12AD6 (V2). Low side to chassis.	262.5KC (400~ Mod)	Tuning gang fully open	DC probe to point (A). Common to chassis.	A1, A2, A3	Adjust for maximum deflection.
2.	"	"	"	"	"	A4	Adjust for MINIMUM deflection. Repeat steps 1 and 2.
3.	Fig. 1	Thru dummy to antenna receptacle.	1610KC	1610KC	Across voice coil	A5, A6, A7	Adjust for maximum output.
4.	With radio installed in car and antenna fully extended, tune in a weak station near 1200KC and adjust A7 for maximum output.						

PUSHBUTTON ADJUSTMENT

1. Tune manually to desired station.
2. Pull pushbutton out.
3. Press pushbutton in firmly.
4. Repeat for remaining buttons.

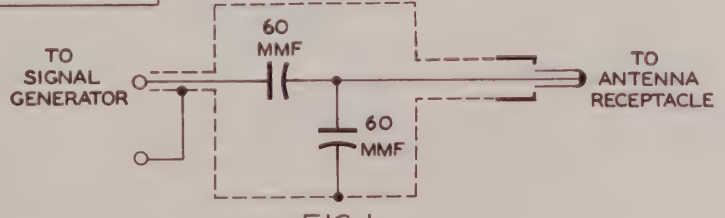


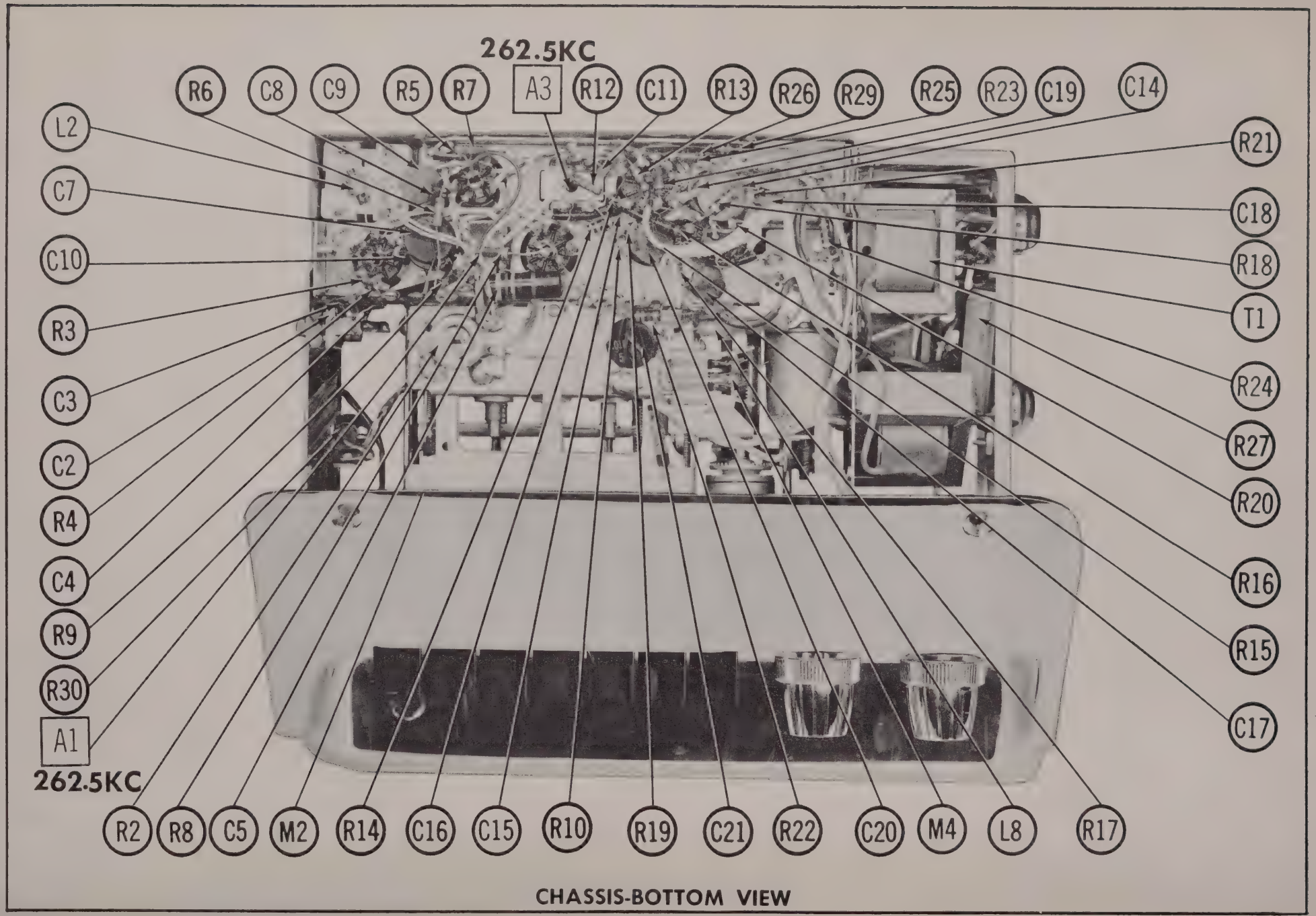
FIG. 1

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. Reproduction or use, without express permission, of editorial or pictorial content, in any manner, is prohibited. No patent liability is assumed with respect to the use of the information contained herein. © 1958 Howard W. Sams & Co., Inc., Indianapolis 5, Indiana. Printed in U.S. of America

H618

MOPAR MODEL 925 (P-5803)
MOPAR MODEL 925 (P-5803)
SET 416 FOLDER 8



CHASSIS-BOTTOM VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	12BL6	
V2	Converter	12AD6	
V3	IF Amplifier	12CX6	Note 1
V4	Det. - AVC - Driver	12DL8	
V5	Trigger - AF Amp.	12U7	

Note 1. Alternate type 12BL6.

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	AR9	Output					PNP
X2	AR9	Output					PNP

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	PHILCO PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■500	16	61-0086-10	AFH3-54-50		WP200.7			R2665 *
B	▲200	16				TT25X5			
C	5	25							

* Non-Catalog Item

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	PHILCO PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	5-80		31-6533-1						
C3	100		30-1251-22	BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C4	5								5% Note 1
C5	.047	200	30-4650-45	P288N-047	DF-503	CUB2S47	GEM-4147	2TM-S47	
C6A	19-160								
B	325-395		31-6522-8						
C	100								
C7	10000		30-1238-2	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C8	33		30-1251-9	NPO-DI 33	DD-330	L10Q33	ZT-5433	5TCC-Q33	10%
C9	100		30-1251-22	N750-DI 100	DTN-100	C10T1U	NT-531	5TCU-T1	N750
C10	10000		30-1238-2	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C11	220		30-1238-4	BPD-00022	DD-221	L10T22	UC-5322	5GA-T22	
C12	100		30-1238-11	BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C13	4000		30-1238-18	BPD-004	DD-402	BYA10D4	UC-5240	5HK-D4	Note 2
C14	4000		30-1238-18	BPD-004	DD-402	BYA10D4	UC-5240	5HK-D4	
C15	100		30-1238-11	BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C16	100		30-1238-11	BPD-0001	DD-101	L10T1	UC-531	5GA-T1	
C17	10000		30-1238-2	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C18	220		30-1238-4	BPD-00022	DD-221	L10T22	UC-5322	5GA-T22	
C19	10000		30-1238-2	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C20	10000		30-1238-2	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C21	10000		30-1238-2	BPD-01	DD-103	BYA10S1	DC511	5HK-S1	
C22	300		30-1254-1						

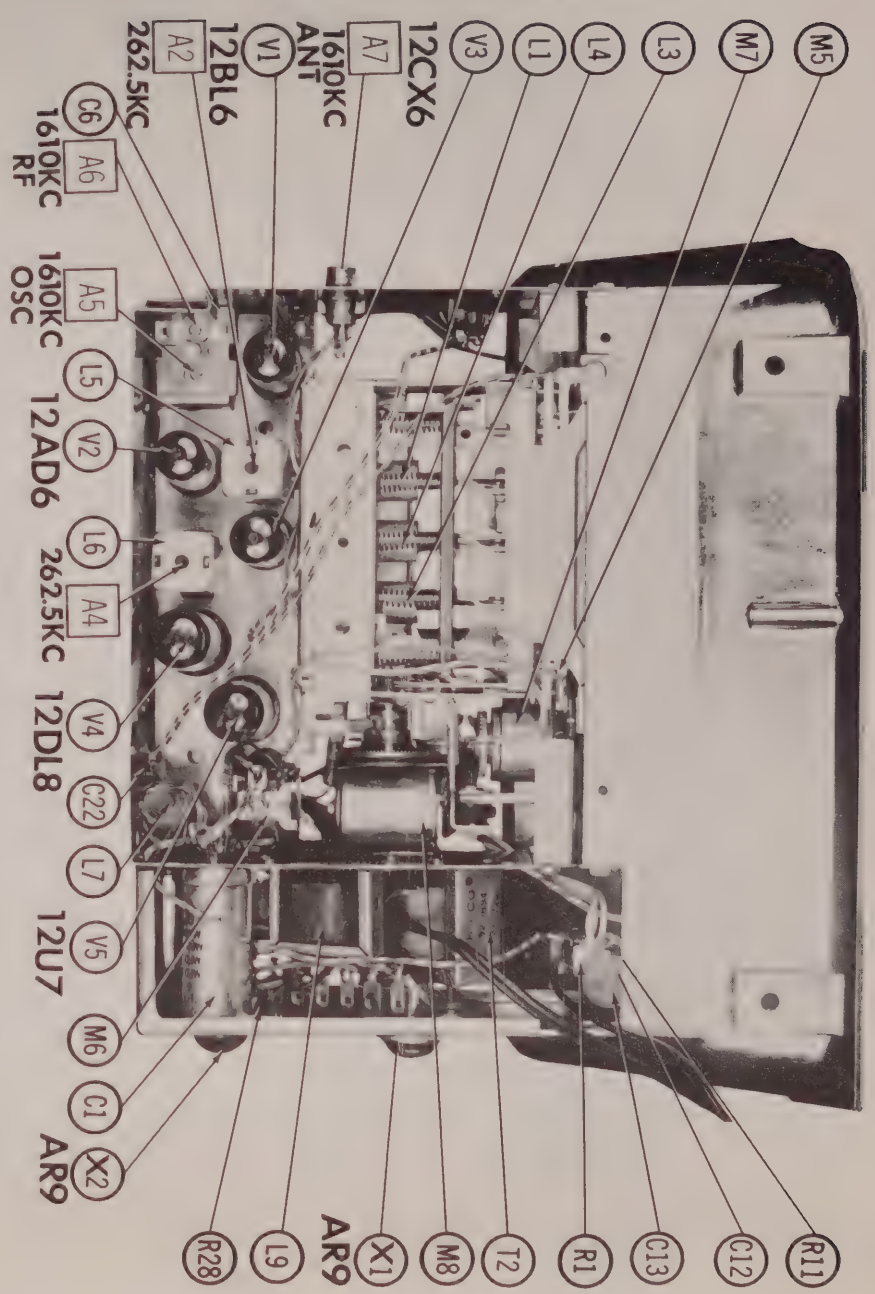
Note 1. Some versions may use 10mmf in this application (Part #30-1251-6).
Note 2. Some versions may use 10000mmf in this application (Part #30-1238-2).

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	PHILCO PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	4meg	½	33-5580-17 *					Tone
B	1meg							Volume, Tap @ 300K
C	Switch							
R2	150Ω	2(WW)	33-5591-4		39-150		FL-150	Search Sensitivity

* Tone control open in center of range, 2 meg each side of center.

CHASSIS—TOP VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING OHMS	RATING WATT	PHILCO PART No.	NOTES
R3	150K		66-4158340	
R4	1200Ω		66-2128340	
R5	1meg		66-5108340	
R6	6.8meg		66-5688340	
R7	47K		66-3478340	
R8	4.7meg		66-5478340	Note 1
R9	22meg		66-6228340	
R10	100K		66-4108340	Note 2
R11	100K		66-4108340	
R12	1.2meg		66-5128340	
R13	100Ω		66-1108340	
R14	470Ω		66-1478340	
R15	3.3meg		66-5338340	
R16	1meg		66-5108340	
R17	1.5meg		66-5158340	Note 3
R18	68Ω		66-0688340	
R19	470Ω		66-1478340	
R20	3.3meg		66-5338340	
R21	220K		66-4228340	
R22	330Ω		66-1338340	
R23	3.3meg		66-5338340	
R24	470Ω		66-1478340	Note 4
R25	56Ω		66-0568340	
R26	4.7Ω	(WW)	66-9473360	
R27	330Ω	5	33-1367-4	Note 5
R28	4.7Ω	(WW)	66-9473260	
R29	33Ω		66-0338340	
R30	27Ω	2	66-0276340	

Note 1. Some versions may use 10meg in this application (Part #66-6108340).
Note 2. Some versions may use 220K in this application (Part #66-4228340).
Note 3. Some versions may use 1.2meg in this application (Part #66-5128340).
Note 4. Some versions may use 100Ω in this application (Part #66-1108340).
Note 5. Temperature compensating unit.

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA PHILCO PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	NOTES
L1	Antenna Coil	32-4730-19					Note 1
L2	RF Choke	32-4480-24	19-3160	TV-196	6120		150 Microhenries
L3	RF Coil	32-4730-20					Note 1
L4	Osc. Coil	32-4730-21					Note 1
L5	Input IF	32-4676-2	16-6756	BC-344	12-H1	RF-3	
L6	Output IF	32-4677-8					
L7	"A" Lead Choke	32-4720-3					
L8	RF Choke						7.5 Microhenries, IRC Part #CL-1 Note 2

Note 1. Part of Tuner M3. Note 2. Not used in some versions.

FILTER CHOKE

ITEM No.	RATINGS CURRENT (Measured)	RATINGS DC RES.	RATINGS INDUCTANCE (0 CURRENT 1000 ∿)	REPLACEMENT DATA PHILCO PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
L9	.011A	19Ω	.5 Hy	32-8788						

TRANSFORMER (DRIVER)

ITEM No.	TURNS RATIO PRI.	TURNS RATIO SEC.	REPLACEMENT DATA PHILCO PART No.	Halldorson PART No.	Merit PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T1	3	: 1	32-8835				TR-66①		① Drill new mounting hole.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE PRI.	IMPEDANCE SEC.	REPLACEMENT DATA PHILCO PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	NOTES
T2	60ΩCT	3-4Ω	32-8834							

SPEAKER

ITEM No.	TYPE SIZE	TYPE FIELD	TYPE V. C. IMP.	REPLACEMENT DATA PHILCO PART No.	QUAM PART No.	NOTES
SP1	5" X 7"	PM	3-4Ω	36-1670-2	57A15	

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA PHILCO PART No. FUSE	PHILCO PART No. HOLDER	LITTELFUSE PART No. FUSE	LITTELFUSE PART No. HOLDER	BUSS PART No. FUSE	BUSS PART No. HOLDER
M1		7½A 32V	45-2656-53					

MISCELLANEOUS

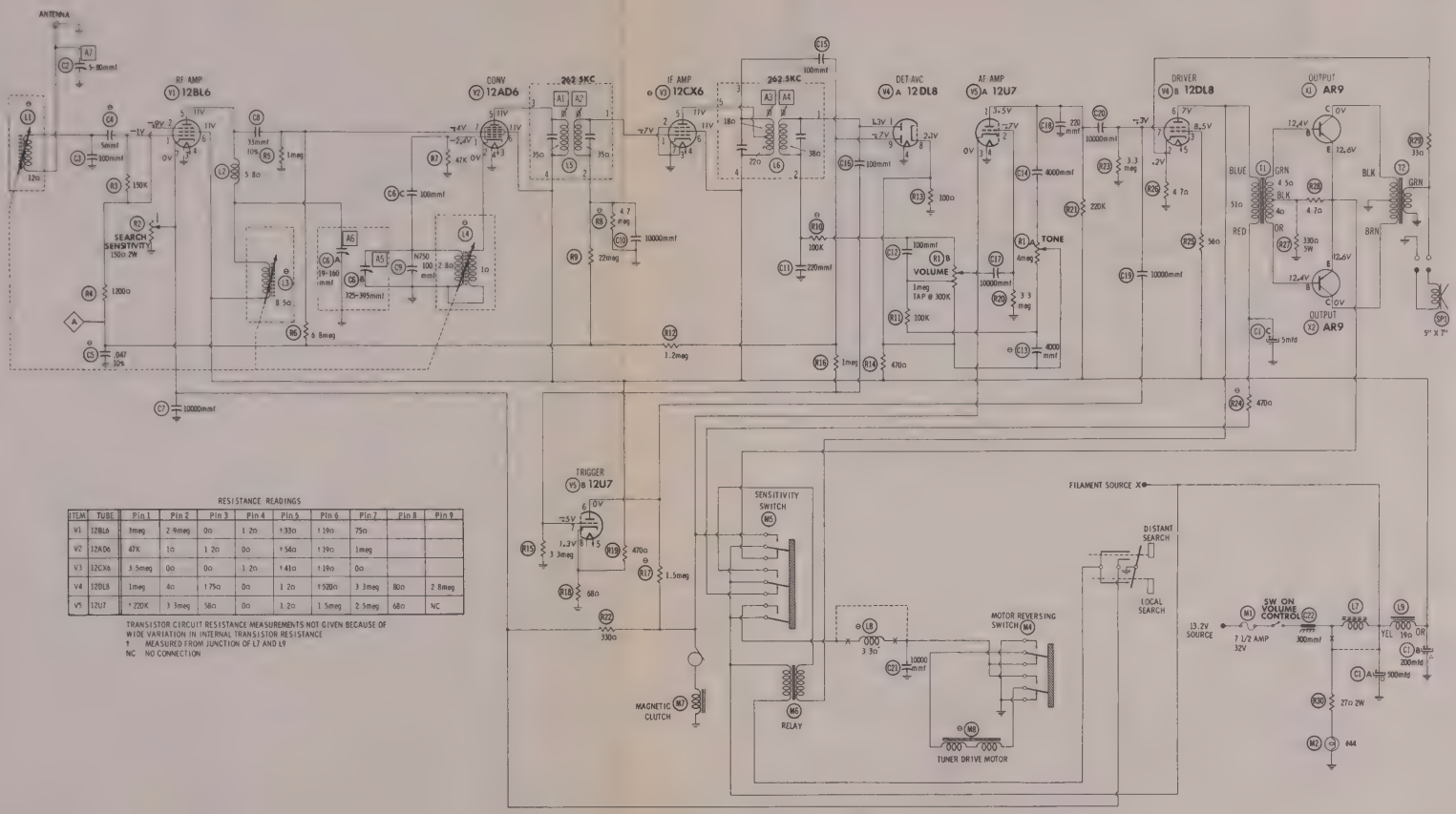
ITEM No.	PART NAME	PHILCO PART No.	NOTES
M2	Lamp	32-2064	#44
M3	Tuner	76-10377-1	Complete
M4	Switch	76-11522	Motor Reversing (Part of M3)
M5	Switch	76-11411-1	Sensitivity, Assembly (Part of M3)
M6	Relay	42-4033	Alternate Part #42-4032
M7	Clutch Ass'y	76-11519	Magnetic (Part of M3)
M8	Motor	76-10379-1	Tuner Drive, Includes Bracket Assembly (Part of M3)

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors
Shielded Hook-up Wire ..... Use BELDEN No. 8885
Bonding Strap ..... Use BELDEN No. 8661



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12BL6	3meg	2.9meg	0Ω	1.2Ω	†33Ω	†19Ω	75Ω		
V2	12AD6	47K	1Ω	1.2Ω	0Ω	†54Ω	†19Ω	1meg		
V3	12CX6	3.5meg	0Ω	0Ω	1.2Ω	†41Ω	†19Ω	0Ω		
V4	12DL8	1meg	4Ω	†75Ω	0Ω	1.2Ω	†520Ω	3.3meg	80Ω	2.8meg
V5	12U7	†220K	3.3meg	58Ω	0Ω	1.2Ω	1.5meg	2.5meg	68Ω	NC

TRANSISTOR CIRCUIT RESISTANCE MEASUREMENTS NOT GIVEN BECAUSE OF WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE
† MEASURED FROM JUNCTION OF L7 AND L9
NC NO CONNECTION

› SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

1. DC voltage measurements taken with vacuum tube voltmeter.
2. Socket connections shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 12.6 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings
6. Volume control at maximum, no signal applied for voltage measurements

A PHOTOFACT STANDARD NOTATION SCHEMATIC
Howard W. Sams & Co., Inc. 1958

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

MOTOROLA MODELS CTM8X, CTM57X, 398X

MOTOROLA MODELS
CTM8X, CTM57X, 398X

MODEL CTM8X

MOTOROLA MODELS
CTM8X, CTM57X, 398X

TRADE NAME	Motorola Models CTM57X (1957 Chevrolet), CTM8X (1958 Chevrolet), 398X (Universal Type)
MANUFACTURER	Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Illinois
TYPE SET	Battery Operated AM Automobile Receiver With Transistorized Output
TUBES (Five)	Types 12BL6 RF Amplifier, 12AD6 Converter, 12BL6 IF Amplifier, 12F8 Det.-AVC-1st. AF Amp., 12K5 2nd. AF Amplifier
POWER SUPPLY	12 Volt Storage Battery — RATING 1.5 Amp. @ 12.6 Volts DC
TUNING RANGE—BROADCAST	540-1610KC

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.1mfd	High side to pin 7 (grid) of 12AD6 (V2). Low side to chassis.	262.5KC (400∿ Mod)	High Freq. End Stop	Across voice coil	A1, A2, A3, A4	Adjust for maximum output.
2.	Fig. 1	Thru dummy to antenna receptacle	1610KC	"	"	A5, A6, A7	"
	Step 3 is not necessary unless tuner has been tampered with or associated components have been replaced. If necessary, back tuning cores (A8, A9, A10) out of coils but not out of coil forms. A tool similar to Fig. 2 may be used. Repeat step 2.						
3.	Fig. 1	Thru dummy to antenna receptacle	1400KC	Tuner carriage 13/64" from high freq. end	Across voice coil	A8, A9, A10	Adjust for maximum output. Repeat steps 2 and 3. Cement cores.
4.	With radio installed in car and antenna fully extended, tune in a weak station near 1400KC and adjust A7 for maximum output.						

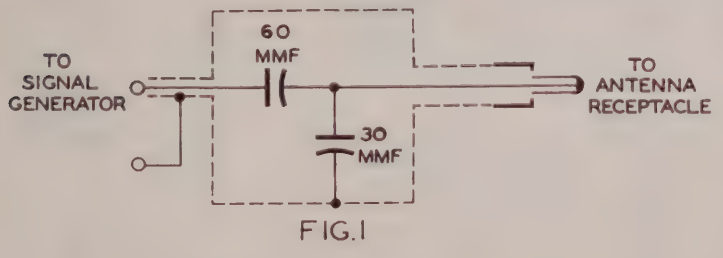


FIG. 1

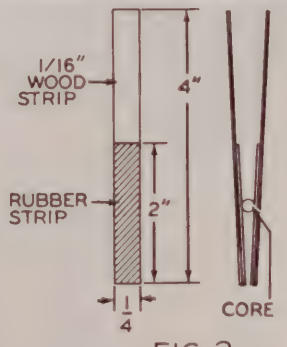


FIG. 2

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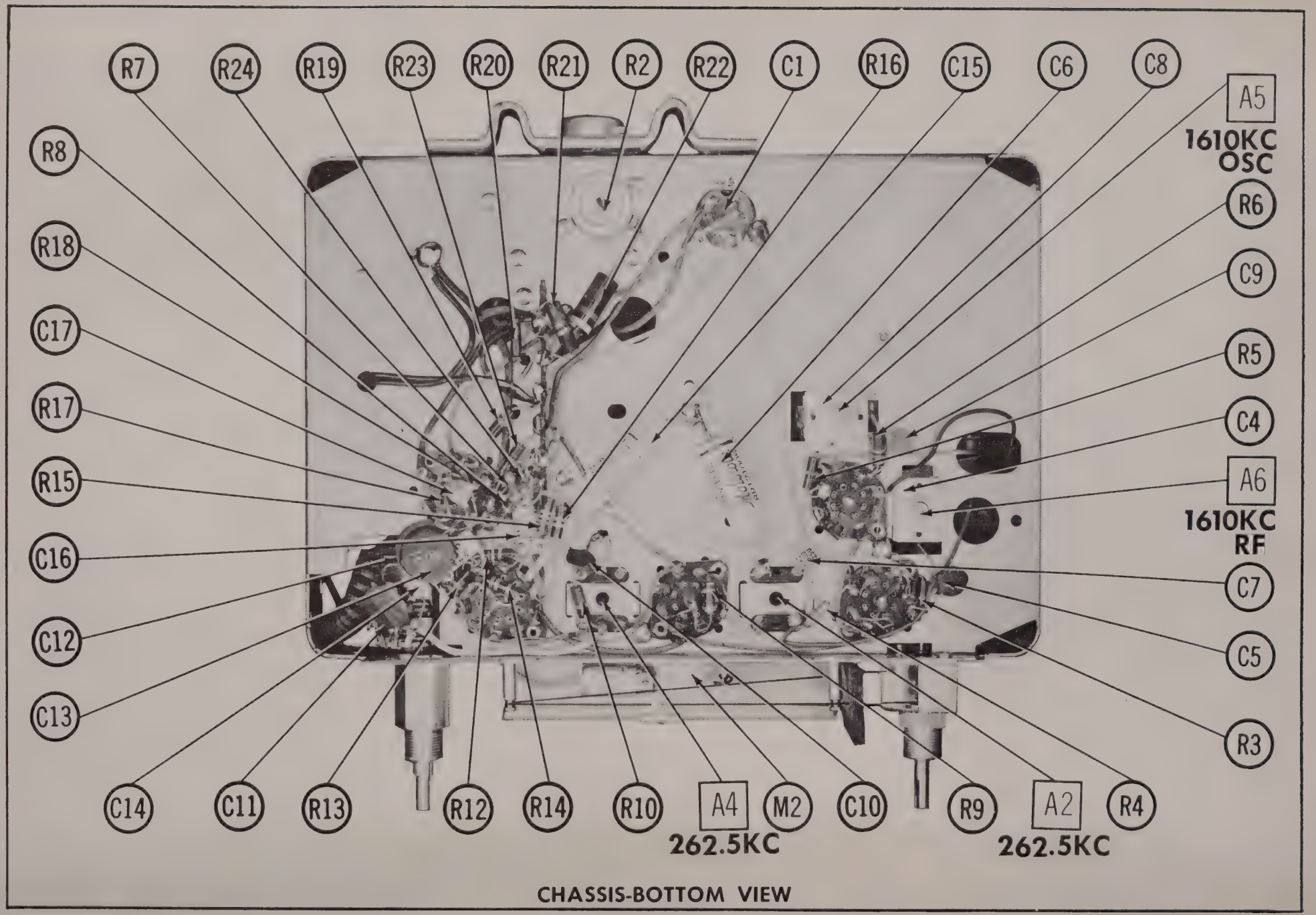
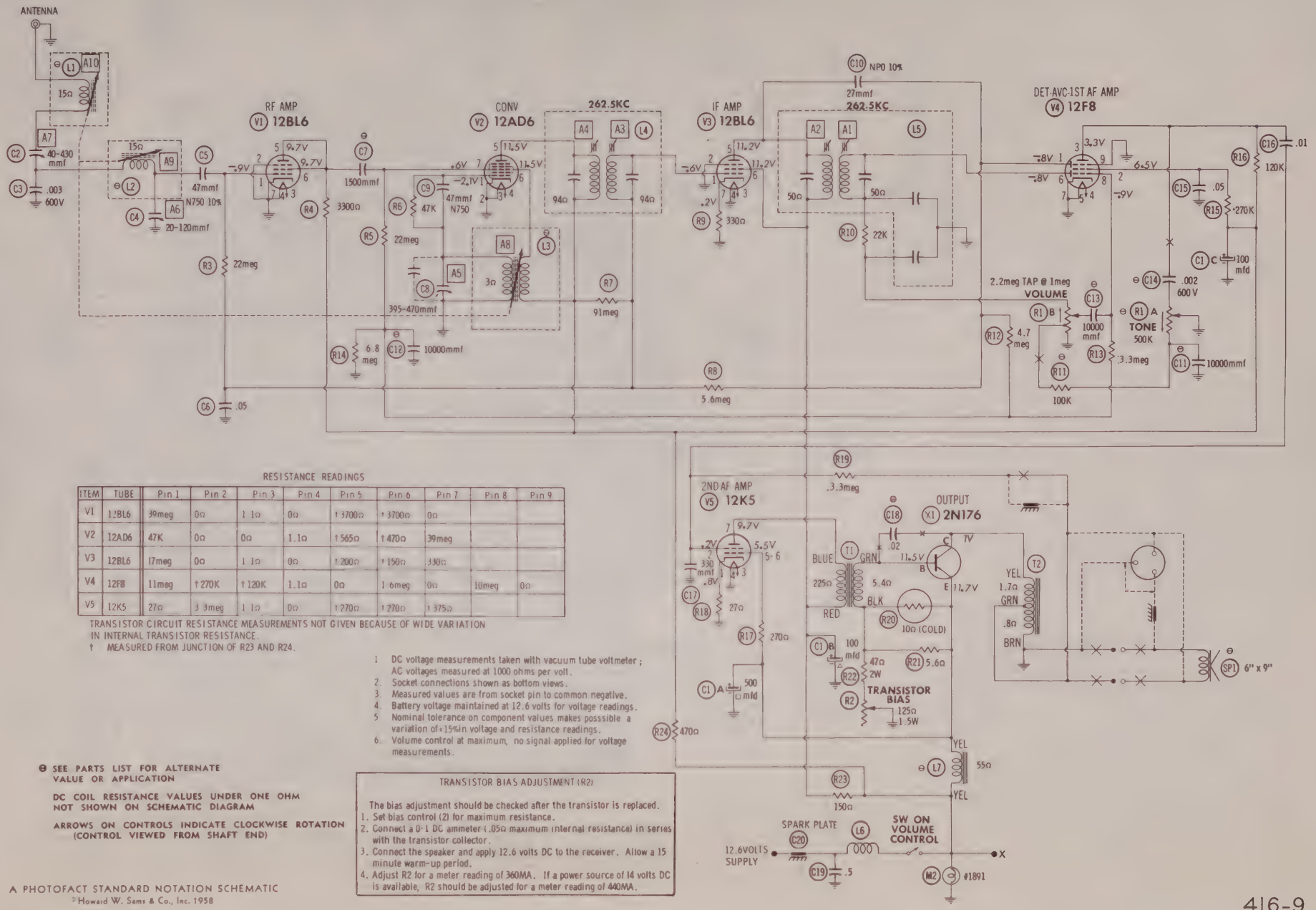
H522

SET 416 FOLDER 9



CHASSIS-BOTTOM VIEW



RESISTANCE READINGS

ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	12BL6	39meg	0Ω	1.1Ω	0Ω	†3700Ω	†3700Ω	0Ω		
V2	12AD6	47K	0Ω	0Ω	1.1Ω	†565Ω	†470Ω	39meg		
V3	12BL6	17meg	0Ω	1.1Ω	0Ω	†200Ω	†150Ω	330Ω		
V4	12F8	11meg	†270K	†120K	1.1Ω	0Ω	1.6meg	0Ω	10meg	0Ω
V5	12K5	27Ω	3.3meg	1.1Ω	0Ω	†270Ω	†270Ω	†375Ω		

TRANSISTOR CIRCUIT RESISTANCE MEASUREMENTS NOT GIVEN BECAUSE OF WIDE VARIATION IN INTERNAL TRANSISTOR RESISTANCE.
† MEASURED FROM JUNCTION OF R23 AND R24.

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Battery voltage maintained at 12.6 volts for voltage readings.
5. Nominal tolerance on component values makes posssible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

⊖ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

ARROWS ON CONTROLS INDICATE CLOCKWISE ROTATION (CONTROL VIEWED FROM SHAFT END)

TRANSISTOR BIAS ADJUSTMENT (R2)

The bias adjustment should be checked after the transistor is replaced.
1. Set bias control (2) for maximum resistance.
2. Connect a 0-1 DC ammeter (.05Ω maximum internal resistance) in series with the transistor collector.
3. Connect the speaker and apply 12.6 volts DC to the receiver. Allow a 15 minute warm-up period.
4. Adjust R2 for a meter reading of 360MA. If a power source of 14 volts DC is available, R2 should be adjusted for a meter reading of 440MA.

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	RF Amplifier	12BL6	
V2	Converter	12AD6	
V3	IF Amplifier	12BL6	

ITEM No.	USE	TYPE	NOTES
V4	Det.-AVC-1st. AF Amp.	12F8	
V5	2nd. AF Amp.	12K5	

TRANSISTORS

ITEM No.	ORIG. TYPE	USE	REPLACEMENT DATA				NOTES
			CBS PART No.	RCA PART No.	RAYTHEON PART No.	SYLVANIA PART No.	
X1	2N176	Output	CBS2N155	2N176		2N176	PNP

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	MOTOROLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	■500	16	23B560487	AFH3-00-90	B0045	WP300.5			R2664 *
B	▲100	16			BBR100-15	TC2501			
C	100	16							

*Non-catalog item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	40-430		20K542456						
C3	.003	600	8R121569	P688N-003	D6-302	CUB6D3	GEM-623	6TM-D3	
C4	20-120		20K541014						
C5	47		21R114207	N750-DI 47	DTN-47	C10Q47U	NT-5447	5TCU-Q47	N750 10%
C6	.05	200	8R121005	P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5	
C7	1500		21R120100	BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	①
C8	395-470		20A485708						
C9	47		21R115593	N750-DI 47	DTN-47	C10Q47U	NT-5447	5TCU-Q47	N750
C10	27		21R410089		DTZ-27				NPO 10%
C11	10000		21R482726	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	②
C12	10000		21R482726	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	③
C13	10000		21R482726	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	④
C14	.002	600	8R121568	P688N-002	D6-202	CUB6D2	GEM-622	6TM-D2	
C15	.05	200	8R121005	P288N-05	DF-503	CUB2S5	GEM-415	2TM-S5	
C16	.01	400	8R121002	P488N-01	D6-103	CUB4S1	GEM-411	4TM-S1	

CAPACITORS (cont)

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C17	330		21R410118	BPD-00033	DD-331	L10T33	UC-5333	5GA-T33	
C18	.02	200	8R121003	P288N-02	DD-203	CUB2S2	GEM-412	4TM-S2	②
C19	.5	100	8R121666	P288N-5		CUB2P5	GEM-205	2TM-P5	
C20			64K535152						

① Model 398X uses 220mmf in this application (Part #21K121698).
② Not used in Model 398X.
③ Model 398X uses .05mfd in this application (Part #8R121005).
④ Model 398X uses 1000mmf in this application (Part #21R115386).

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	MOTOROLA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	500K	1/2	18B542657	F1-41	RTV-634C			Tone, Note 1
B	2.2meg	1/2		R2-75	Not req.		■ UE3828S	Volume, Tap ⓐ 1meg
C	Switch			KB-4	Not req.			
R2	125Ω	1.5(WW)	18K542493					Transistor Bias

Note 1. Part #18K542494 used in Model CTM57X. Part #18K542457 (2meg volume & switch)used in Model 398X.
■ "STA-LOC" Equivalent : FA55A, OS1562, RU26T16, IS2000, US-41.

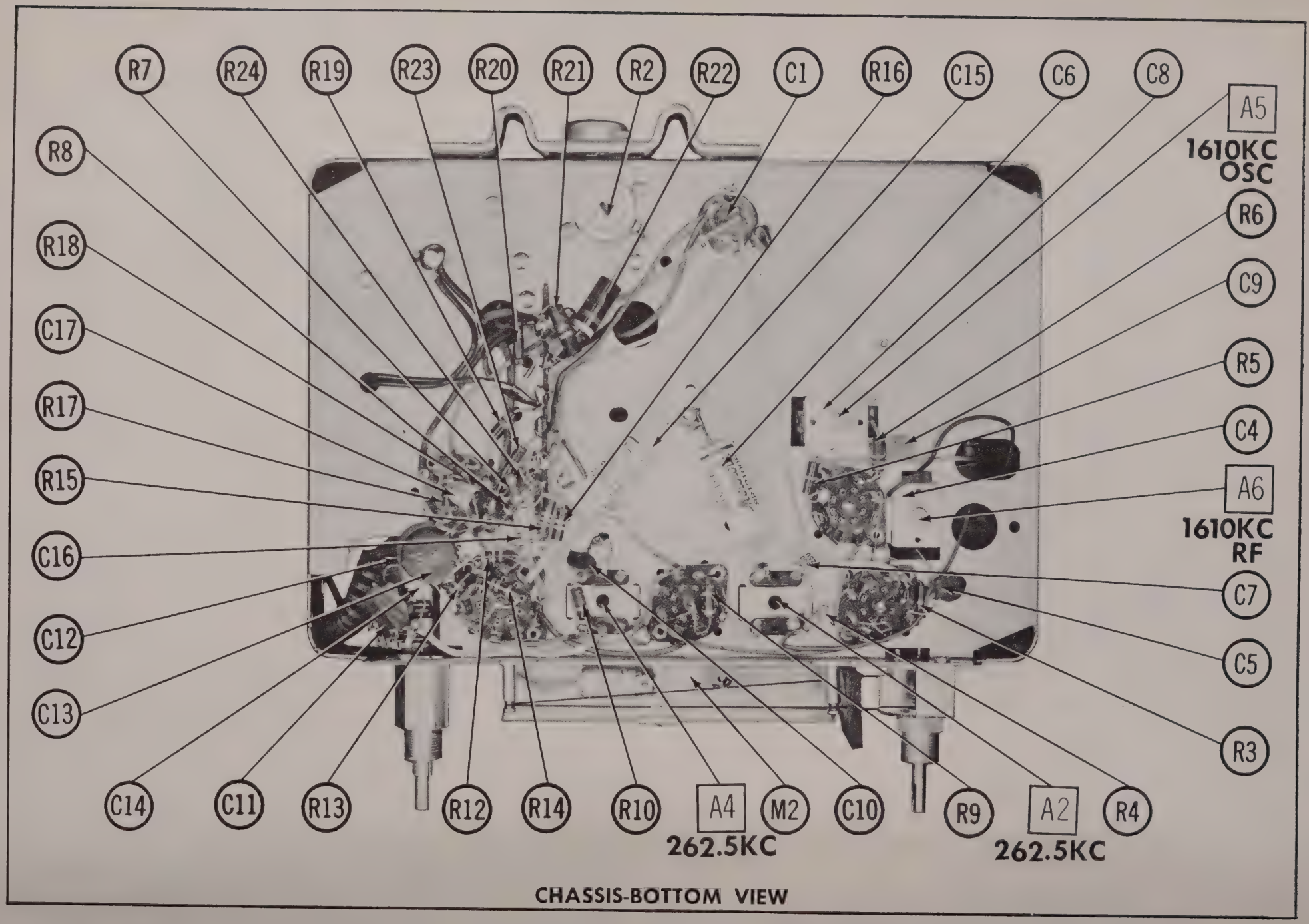
RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R3	22meg		6R118247	
R4	3300Ω		6K121725	
R5	22meg		6R118247	
R6	47K		6K121299	
R7	9Imeg		6K538716	
R8	5.6meg		6R3988	
R9	330Ω		6K127940	
R10	22K		6K119405	
R11	100K		6K122313	Note 1
R12	4.7meg		6K121277	
R13	3.3meg		6K119407	

Note 1. Not used in Model 398X.

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R14	6.8meg		6K121933	
R15	270K		6R6414	
R16	120K		6K125538	
R17	270Ω		6K121303	
R18	27Ω		6B119401	
R19	3.3meg		6K119407	
R20	10Ω Cold		6K540634	
R21	5.6Ω		17K739323	
R22	47Ω	2	6R127673	
R23	150Ω		6K124797	
R24	470Ω		6K127633	



CHASSIS-BOTTOM VIEW

PARTS LIST AND DESCRIPTIONS (Continued)

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					
		MOTOROLA PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No	NOTES
L1	Ant. Coil	24K560430					Note 1
L2	RF Grid Coil	24K560433					Note 1
L3	Osc. Coil	24K560426					Note 1
L4	Input IF	24K542491	16-6752	BC-350	12-H1	RF-3	
L5	Output IF	24K542675	16-6754	BC-354	12-H6		
L6	"A" Lead Choke	24K580706					1.2 Microhenries

Note 1. Part of M3.

FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA						
	CURRENT (Measured)	DC RES.	INDUCTANCE @ CURRENT 1000 ~	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No
L7	.42A ③ 12.6VDC	.6Ω	.001 Hy.	25K542487 ①						

① Part #25B736760 used in Models CTM8X, CTM57X.

TRANSFORMER (INTERSTAGE)

ITEM No.	TURNS RATIO		REPLACEMENT DATA							NOTES
	PRI.	SEC.	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	6.5 :	1	25B540658	GH6 ①				TR21 1	TZ15 2	1 Tape CT on prl. 2 Use orig. channel frame.

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	23Ω tap ③ 3-4Ω		25C542489							

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	MOTOROLA PART No.	QUAM PART No.	
SP1	6" x 9"	PM	3-4Ω	50K541105 ①	69A3	① Used in Models CTM8X, CTM57X
	5 1/4"	PM	3-4Ω	50C534259 ②	52A1	② Used in Model 398X.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			MOTOROLA PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M1		10A 32V	65R10266 ①					

① Part #65R16248 (9A) used in Model CTM57X. Part #65K1624 (9A) used in Model 398X.

MISCELLANEOUS

ITEM No.	PART NAME	MOTOROLA PART No.	NOTES
M2	Dial Lamp	65R533821	#1891
M3	Tuner	77K560424	MT-239, Complete

CABINETS & CABINET PARTS

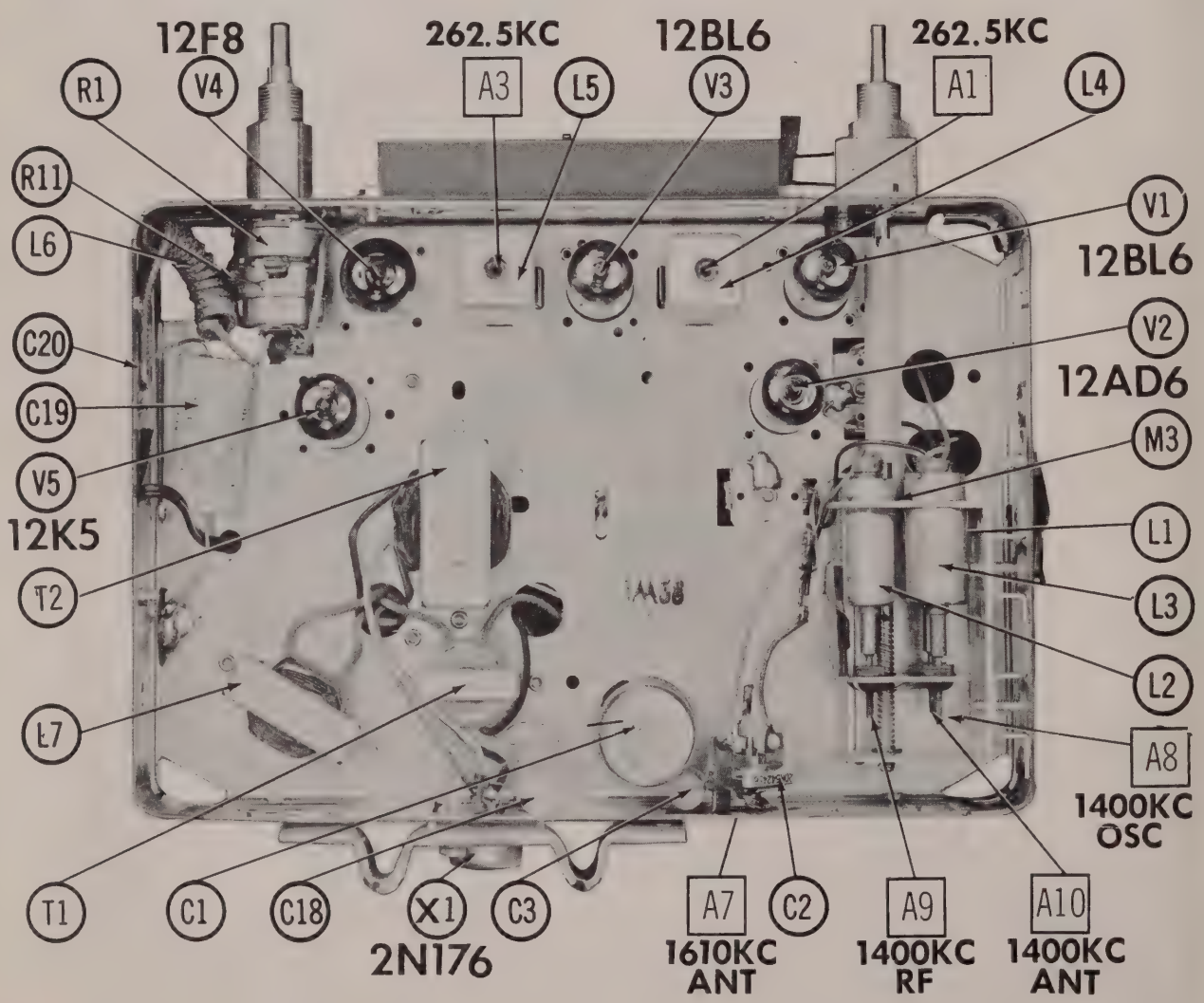
(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	36K541140	Dummy, Model CTM57X
Knob	36K542664	Dummy, Model CTM8X
Knob	36B541139	Tone, Model CTM57X
Knob	36B542663	Tone, Model CTM8X
Knob	36B541129	Volume and Tuning, Model CTM57X
Knob	36B536544	Volume and Tuning, Model 398X
Knob	36B542650	Volume and Tuning, Model CTM8X
Pointer	52A541314	Models CTM8X, CTM57X
Pointer	1A501293	Model 398X
Dial Scale	34B542490	Model 398X
Dial Scale	34B542838	Model CTM8X
Dial Scale	34B542495	Model CTM57X

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors
Shielded Hook-up Wire ..... Use BELDEN No. 8885
Bonding Strap ..... Use BELDEN No. 8661

DIAL CORD STRINGING



CHASSIS - TOP VIEW

PHOTOFACT* Folder

EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

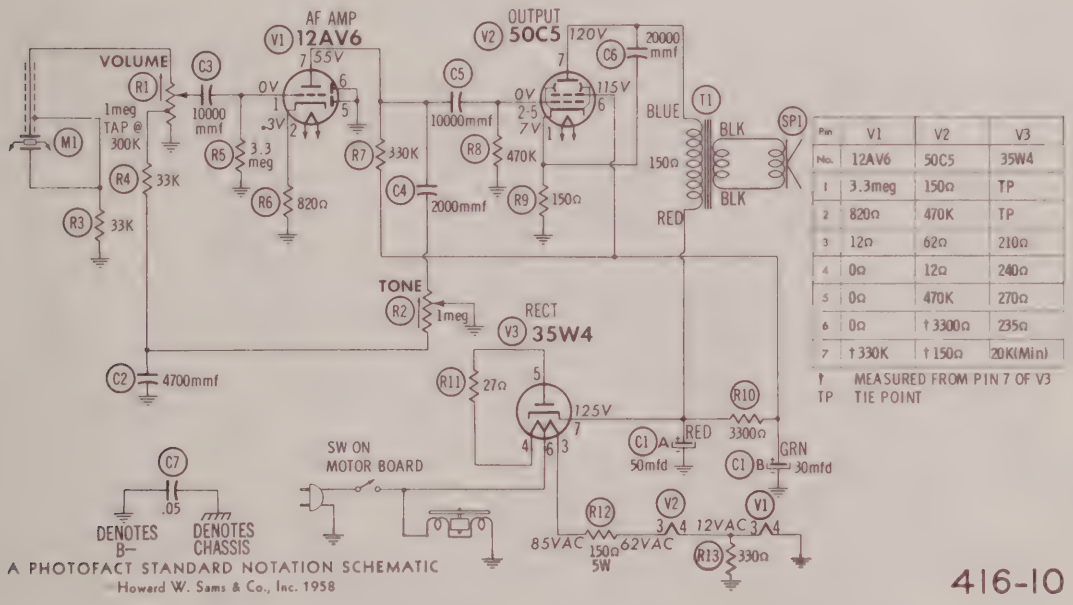
MOTOROLA MODELS 3F22C, E, R (Ch. HS-599)

MOTOROLA MODELS
3F22C, E, R (Ch. HS-599)

MODEL 3F22E

TRADE NAME	Motorola Models 3F22C, 3F22E, 3F22R (Ch. HS-599)
MANUFACTURER	Motorola Inc., 4545 W. Augusta Blvd., Chicago 51, Illinois
TYPE SET	AC Operated Phono Amplifier with 4 Speed Automatic Record Changer
TUBES (Three)	Types 12AV6 AF Amplifier, 50C5 Output, 35W4 Rectifier
POWER SUPPLY	110-120 Volts AC-60 Cycle RATING .28 Amp. @ 117 Volts AC (30 Watts Less Motor)

FOR SERVICE INFORMATION ON RECORD CHANGER—SEE SIMILAR MONARCH UA8—PHOTOFACT SET 381 FOLDER 11.



Pin No.	V1 12AV6	V2 50C5	V3 35W4
1	3.3meg	150Ω	TP
2	820Ω	470K	TP
3	12Ω	62Ω	210Ω
4	0Ω	12Ω	240Ω
5	0Ω	470K	270Ω
6	0Ω	†3300Ω	235Ω
7	†330K	†150Ω	20K(Min)

† MEASURED FROM PIN 7 OF V3
TP TIE POINT

A PHOTOFACT STANDARD NOTATION SCHEMATIC
Howard W. Sams & Co., Inc. 1958

416-10

MOTOROLA MODELS
3F22C, E, R (Ch. HS-599)

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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SET 416 FOLDER 10

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	12AV6	
V2	Output	50C5	
V3	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	MOTOROLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	50	150	23K638794	PRS150V5030	BBRD5315	TCD497	TDLD-8	FMD-301	TVA-2450
B	30	150							

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	MOTOROLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	4700		21R120149	BPD-0047	DD-472	BYA10D47	UC-5247	5HK-D47	
C3	10000		21R482726	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C4	2000		21R121106	BPD-002	DD-202	BYA10D2	DC522	5HK-D2	
C5	10000		21R482726	BPD-01	DD-103	BYA6S1	DC511	5HK-S1	
C6	20000		21A125142	BPD-02	DD-203	BYB6S2		5HK-S2	
C7	.05	400	8R121567	P488N-05	DF-503	CUB4S5	GEM-415	4TM-S5	

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	MOTOROLA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	1meg	½	18K638893	BT-73	A47F-1meg	Q13-137X	UT-438	Volume, Tap @ 300K
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	
R2A	1meg	½	18K638892	B-70	A47-1meg-Z	Q13-137	U53	Tone
B	Shaft			Not Req.	FS-3	Not Req.	Not Req.	

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R3	33K		6K127632	
R4	33K		6K127632	
R5	3.3meg		6K121278	
R6	820Ω		6K121302	
R7	330K		6R2096	
R8	470K		6K121279	

ITEM No.	RATING		MOTOROLA PART No.	NOTES
	OHMS	WATT		
R9	150Ω		6K124797	
R10	3300Ω		6K121725	
R11	27Ω		6B119401	
R12	150Ω	5(WW)	17K636326	
R13	330Ω		6K127940	

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	MOTOROLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	3500Ω	3-4Ω	25C638890	Z1105	A-2930	AU-601	A-3877	22S46	S-16X	

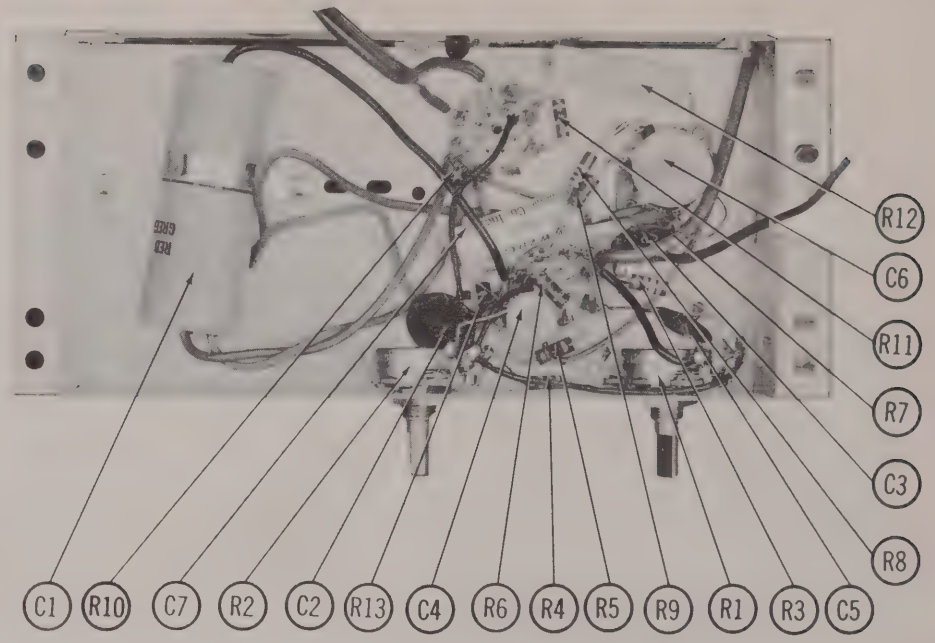
SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	MOTOROLA PART No.	QUAM PART No.	
SP1	6"	PM	3-4Ω	50C638891	6A15	

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	MOTOROLA PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	MOUNT	
M1		81-TB				

CHASSIS—BOTTOM VIEW



PARTS LIST AND DESCRIPTIONS (Continued)

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	MOTOROLA PART No.	JENSEN PART No.	WALCO PART No.	
M2				

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	36K638437	Two Used.
Cabinet	16K638975	Complete, Less Grille and Nameplate, Model 3F22E
Cabinet	16K638973	Complete, Less Grille and Nameplate, Model 3F22C
Cabinet	16K638970	Complete, Less Grille and Nameplate, Model 3F22R
Handle	55K638425	
Hinge	55K638404	Button, Left Hand
Hinge	55K638406	Button, Right Hand

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8530 (Solid) Available in Ten Colors 8524 (Stranded) Available in Ten Colors
Power Cord	Use BELDEN No. 1765-B (6 Ft. Length) 1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting)	Use BELDEN No. 8401
Phono Pick-up Arm Cable	Use BELDEN No. 8430 (Two Conductor - Twisted)

PHOTOFACT* Folder

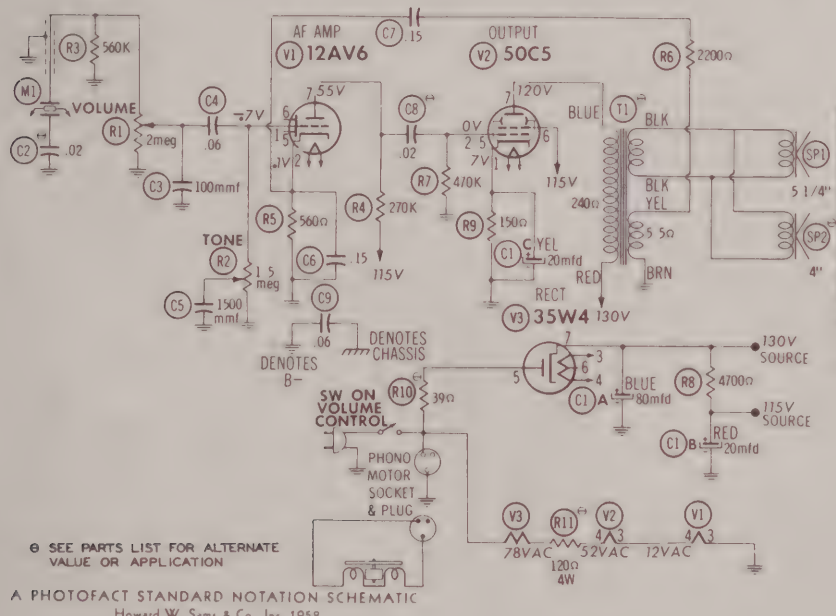
EIA MEMBER ELECTRONIC INDUSTRIES ASSOCIATION

PHONOLA
MODELS 657, 658

PHONOLA
MODELS 657, 658

MODEL 657

TRADE NAME	Phonola Models 657, 658
MANUFACTURER	Waters Conley Co., Inc., Rochester, Minnesota
TYPE SET	AC Operated Phono Amplifier with 4 Speed Manual Record Player
TUBES (Three)	Types 12AV6 AF Amplifier, 50C5 Output, 35W4 Rectifier
POWER SUPPLY	105-125 Volts AC-60 Cycle RATING .275 Amp. @117 Volts AC (25 Watts Less Motor)



Pin No	V1	V2	V3
1	1.5meg	150Ω	NC
2	560Ω	470K	NC
3	0Ω	12Ω	182Ω
4	12Ω	62Ω	215Ω
5	NC	470K	250Ω
6	NC	†4700Ω	NC
7	†270K	†240Ω	20K(Min)

† MEASURED FROM PIN 7 OF V3.
NC NO CONNECTION.

θ SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

A PHOTOFACT STANDARD NOTATION SCHEMATIC

Howard W. Sams & Co. Inc. 1958

416-11

HOWARD W. SAMS & CO., INC. • Indianapolis 5, Indiana

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SET 416 FOLDER 11

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	AF Amplifier	12AV6	
V2	Output	50C5	

ITEM No.	USE	TYPE	NOTES
V3	Rectifier	35W4	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING		REPLACEMENT DATA						
	CAP.	VOLT.	PHONOLA PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	80	150	12145	PRS150/25V 8040/20	BBRQ53215C	WQ230	TDLT-19	FMT-333	R2318*
B	20	150							
C	20	25							

* Non-Catalog Item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING		REPLACEMENT DATA						NOTES
	CAP.	VOLT	PHONOLA PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	
C2	.02	200	11508	P288N-02	DD-203	CUB2S2	GEM-412	2TM-S2	Note 1
C3	100		11534	DI-100	DD-101	L10T1	UC-531	5GA-T1	
C4	.06	200	11509	P288N-06		CUB6S6	GEM-416	6TM-S6	
C5	1500		12570	BPD-0015	DD-152	BYA10D15	DC5215	5HK-D15	
C6	.15	200	11510	P288N-15		CUB2P15	GEM-2015	2TM-P15	
C7	.15	200	11510	P288N-15		CUB2P15	GEM-2015	2TM-P15	
C8	.02	200	11508	P288N-02	DD-203	CUB2S2	GEM-412	2TM-S2	Note 1
C9	.06	200	11509	P288N-06		CUB6S6	GEM-416	6TM-S6	

Note 1. Model 658 uses .01mfd in this application.

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	PHONOLA PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1	2meg	½	11512					Volume & Switch
R2	1.5meg	½	12508					Tone

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		PHONOLA PART No.	NOTES
	OHMS	WATT		
R3	560K		8842	
R4	270K		8841	
R5	560Ω		10921	
R6	2200Ω		10986	
R7	470K		10305	

ITEM No.	RATING		PHONOLA PART No.	NOTES
	OHMS	WATT		
R8	4700Ω		10429	
R9	150Ω		9897	
R10	39Ω		10428	Note 1
R11	120Ω	4	10306	Note 2

Note 1. Not used in Model 658
Note 2. Model 658 uses 180Ω 7W

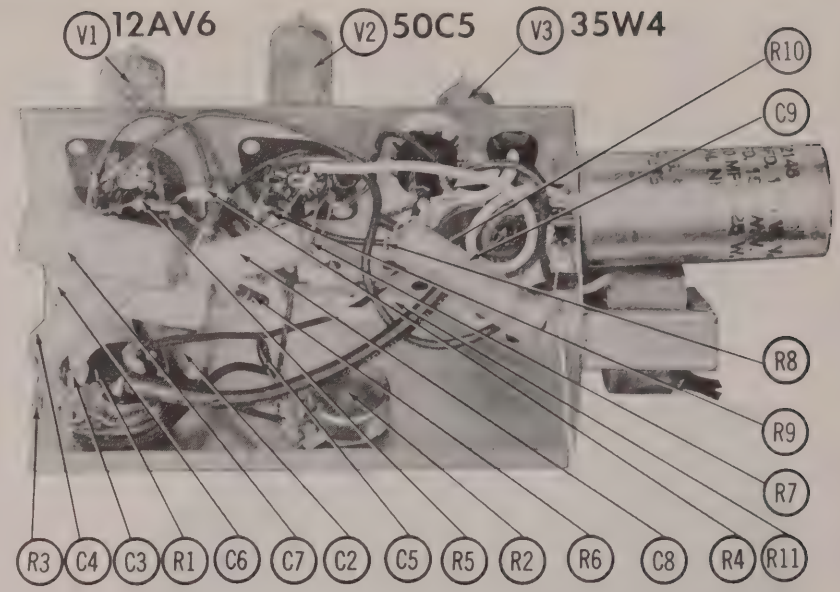
TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.1	PHONOLA PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T1	2300Ω	1-2Ω	12601 ①							①Alternate Part #11503

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	PHONOLA PART No.	QUAM PART No.	
SP1	5 1/4"	PM	3-4Ω	10901 ①	52A1	①Connect in parallel and phase
SP1	4"	PM	3-4Ω	11792 ①②	4A07	② Part #13095 (With T1) used inModel 658

CHASSIS—BOTTOM VIEW



PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	PHONOLA PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	MOUNT	
M1	12132	55-T	GD-J			* Tone arm complete with cartridge.
	* 12125-7 ①	* P-55-T				① Part #12994 used in Model 658

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	PHONOLA PART No.	JENSEN PART No.	WALCO PART No.	
M2		† A-71 or † ♦ A-71SD or ♦ A-71D	* W-8TPA or † W-8TPS or † ♦ W-8DS or ♦ W-8TPD	* Metal † Jewel ♦ Diamond

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Knob	12126-7E	On-Off-Volume, Tone; Model 657
Knob	12126-8E	On-Off-Volume, Tone; Model 658
Case	657	Model 657
Case	658	Model 658

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors
Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)
Low-Loss Shielded Lead (Interconnecting) ..... Use BELDEN No. 8401
Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor - Twisted)

PHOTOFACT* Folder

ZENITH MODELS HF1178RD, HF1185MD, RD, HF1284D, ED, LD, YD, HF1286RD (Ch. 11A20, 11A21)

ZENITH MODELS HF1178RD, HF1185MD, RD, HF1284D, ED, LD, YD, HF1286RD (Ch. 11A20, 11A21)

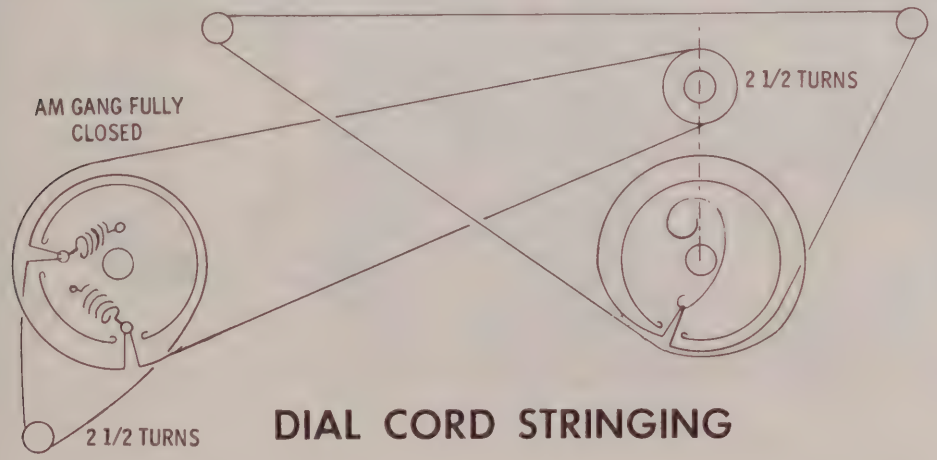
MODEL HF1286RD

ZENITH MODELS HF1178RD, HF1185MD, RD, HF1284D, ED, LD, YD, HF1286RD (Ch. 11A20, 11A21)

TRADE NAME	Zenith Models HF1178RD, HF1185MD, HF1185RD (Ch. 11A20); HF1284D, HF1284ED, HF1284LD, HF128YD, HF1286RD (Ch. 11A21)		
MANUFACTURER	Zenith Radio Corp., 6001 Dickens Ave., Chicago 39, Illinois		
TYPE SET	AC Operated FM-AM Receiver With 4 Speed Automatic Record Changer		
TUBES	Eleven		
POWER SUPPLY	110-120 Volts AC-60 Cycles	RATING	1.03 Amp. @ 117 Volts AC (105 Watts Less Phono)
TUNING RANGE - BROADCAST	535 - 1620KC	FREQ. MOD.	88 - 108MC

FOR SERVICE INFORMATION ON RECORD CHANGER S-14080 OR S-14086—SEE ZENITH S-14086 - PHOTOFACT SET 402 FOLDER 15

FOR SERVICE INFORMATION ON RECORD CHANGER S-14084 OR S-14085—SEE ZENITH S-14084 - PHOTOFACT SET 392 FOLDER 14



DIAL CORD STRINGING

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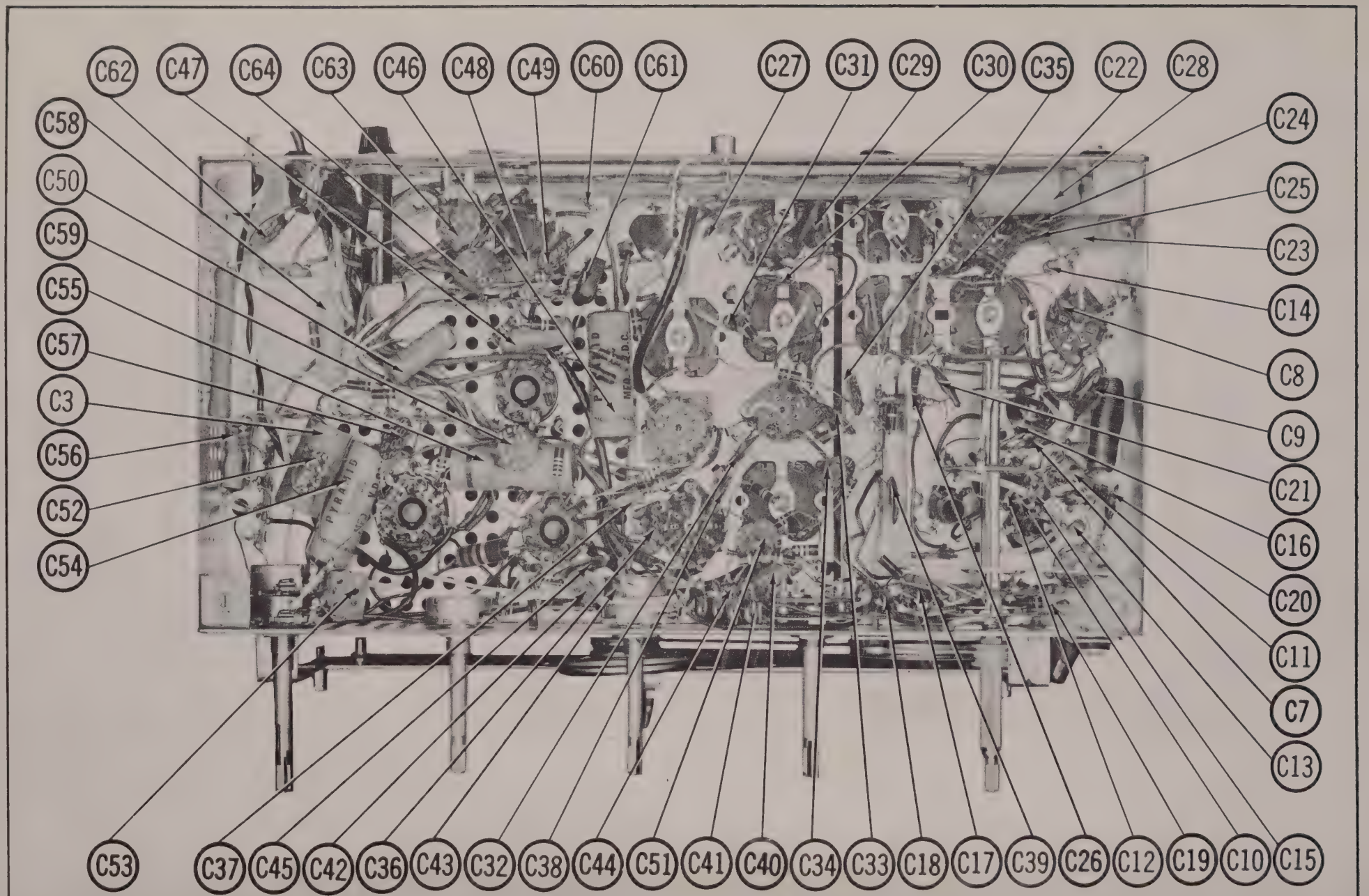
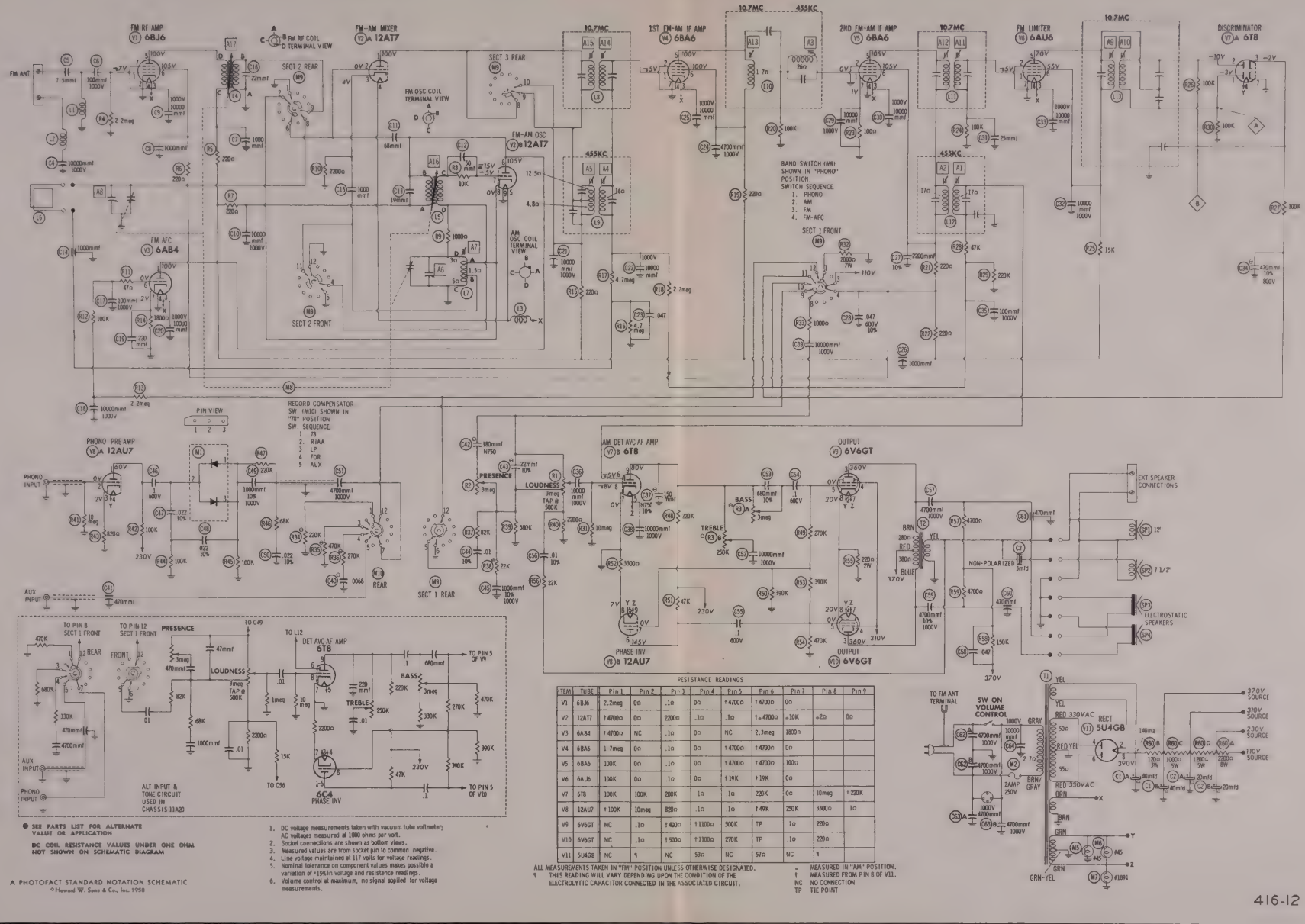
H572

SET 416 FOLDER 12



CHASSIS BOTTOM VIEW-CAPACITOR IDENTIFICATION



● SEE PARTS LIST FOR ALTERNATE VALUE OR APPLICATION

DC COIL RESISTANCE VALUES UNDER ONE OHM NOT SHOWN ON SCHEMATIC DIAGRAM

A PHOTOFACT STANDARD NOTATION SCHEMATIC

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RESISTANCE READINGS

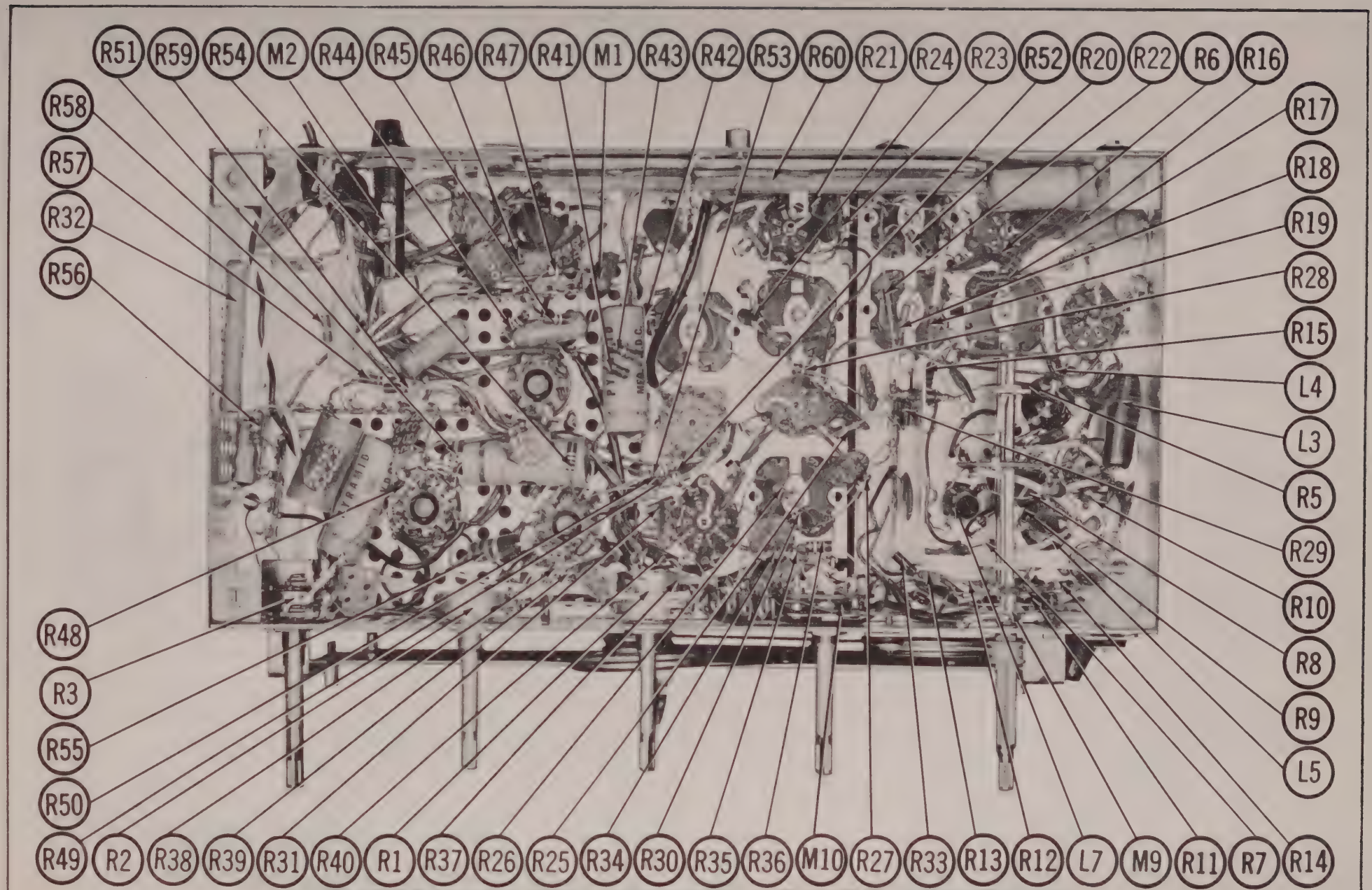
ITEM	TUBE	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V1	6BJ6	2.2meg	0Ω	.1Ω	0Ω	↑4700Ω	↑4700Ω	0Ω		
V2	12AT7	↑4700Ω	0Ω	2200Ω	.1Ω	.1Ω	↑▫4700Ω	▫10K	▫2Ω	0Ω
V3	6AB4	↑4700Ω	NC	.1Ω	0Ω	NC	2.3meg	1800Ω		
V4	6BA6	1.7meg	0Ω	.1Ω	0Ω	↑4700Ω	↑4700Ω	0Ω		
V5	6BA6	100K	0Ω	.1Ω	0Ω	↑4700Ω	↑4700Ω	100Ω		
V6	6AU6	100K	0Ω	.1Ω	0Ω	↑19K	↑19K	0Ω		
V7	6T8	100K	100K	200K	1Ω	.1Ω	220K	0Ω	10meg	↑220K
V8	12AU7	↑100K	10meg	820Ω	.1Ω	.1Ω	↑49K	250K	3300Ω	1Ω
V9	6V6GT	NC	.1Ω	↑400Ω	↑1100Ω	500K	TP	1Ω	220Ω	
V10	6V6GT	NC	.1Ω	↑500Ω	↑1100Ω	270K	TP	.1Ω	220Ω	
V11	5U4GB	NC	¶	NC	53Ω	NC	57Ω	NC	¶	

ALL MEASUREMENTS TAKEN IN "FM" POSITION UNLESS OTHERWISE DESIGNATED.
¶ THIS READING WILL VARY DEPENDING UPON THE CONDITION OF THE ELECTROLYTIC CAPACITOR CONNECTED IN THE ASSOCIATED CIRCUIT.

▫ MEASURED IN "AM" POSITION.
↑ MEASURED FROM PIN 8 OF V11.
NC NO CONNECTION
TP TIE POINT

1. DC voltage measurements taken with vacuum tube voltmeter; AC voltages measured at 1000 ohms per volt.
2. Socket connections are shown as bottom views.
3. Measured values are from socket pin to common negative.
4. Line voltage maintained at 117 volts for voltage readings.
5. Nominal tolerance on component values makes possible a variation of ±15% in voltage and resistance readings.
6. Volume control at maximum, no signal applied for voltage measurements.

416-12



CHASSIS BOTTOM VIEW - RESISTOR, INDUCTOR, & MISC IDENT.

ALIGNMENT INSTRUCTIONS

ALIGNMENT INSTRUCTIONS—READ CAREFULLY BEFORE ATTEMPTING ALIGNMENT

Volume control should be at maximum position. Output of signal generator should be no higher than necessary to obtain an output reading. Use an insulated alignment screwdriver for adjusting.

AM ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
1.	.05mfd	High side to pin 2 (grid) of 12AT7 (V2). Low side to chassis.	455KC (400∿ Mod)	AM	Tuning gang fully open	Across voice coil	A1, A2, A3, A4, A5	Adjust for maximum output.
2.	"	High side to AM-antenna stator lug of tuning gang. Low side to chassis.	1600KC	"	1600KC	"	A6	"
3.	"	"	600KC	"	600KC	"	A7	"
4.	"	"	1400KC	"	Tune to 1400KC signal	"	A8	Adjust for maximum output. Repeat steps 2, 3 and 4.

FM IF ALIGNMENT, USING AM SIGNAL GENERATOR AND VTVM

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT VTVM	ADJUST	REMARKS
5.	.05mfd	High side to pin 1 (grid) of 6AU6 (V6). Low side to chassis.	10.7MC (Unmod)	FM	Point of non-interference	DC probe thru 2 meg res. to point (A). Common to chassis.	A9	Adjust for maximum deflection.
6.	"	"	"	"	"	DC probe thru 2 meg to point (B). Common to chassis.	A10	Adjust for zero reading. A positive and negative reading will be obtained on either side of the correct setting.
7.	"	High side to pin 2 (grid) of 12AT7 (V2). Low side to chassis.	"	"	"	DC probe thru 2 meg to point (A). Common to chassis.	A11, A12, A13, A14, A15	Adjust for maximum deflection.

FM IF ALIGNMENT, USING FM SIGNAL GENERATOR AND OSCILLOSCOPE

Use frequency modulated signal with 60∿ modulation and 450KC sweep. Use 120∿ sawtooth voltage in scope for horizontal deflection.

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	CONNECT SCOPE	ADJUST	REMARKS
5.	.05mfd	High side to pin 1 (grid) of 6AU6 (V6). Low side to chassis.	10.7MC (450KC Swp)	FM	Point of non-interference	Vert. Amp. to point (A). Low side to chassis.	A9	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.
7.	"	"	"	"	"	Vert. Amp. to point (B). Low side to chassis.	A10	Adjust so that 10.7MC occurs at center of crossover lines similar to Fig. 2. SLIGHTLY retouch A9 for maximum amplitude and straightness of crossover lines.
7.	"	High side to pin 2 (grid) of 12AT7 (V2). Low side to chassis.	"	"	"	Vert. Amp. to point (A). Low side to chassis.	A11, A12, A13, A14, A15	Adjust for curve of maximum amplitude and symmetry similar to Fig. 1.

FM RF ALIGNMENT

	DUMMY ANTENNA	SIGNAL GENERATOR COUPLING	SIGNAL GENERATOR FREQUENCY	BAND SWITCH POS.	RADIO DIAL SETTING	OUTPUT METER	ADJUST	REMARKS
8.	270Ω Carbon Resistor	High side thru 270Ω to FM antenna terminal. Low side to chassis.	98MC	FM	98MC	DC probe thru 2 meg to point (A) Low side to chassis.	A16, A17	Adjust for maximum deflection.

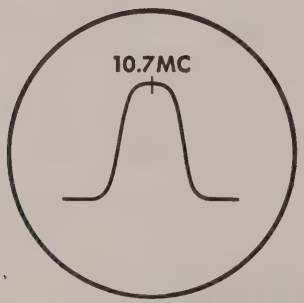


FIG. 1

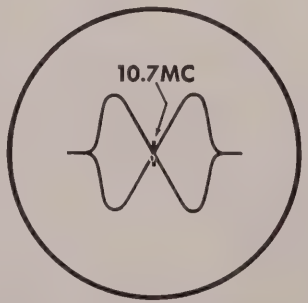
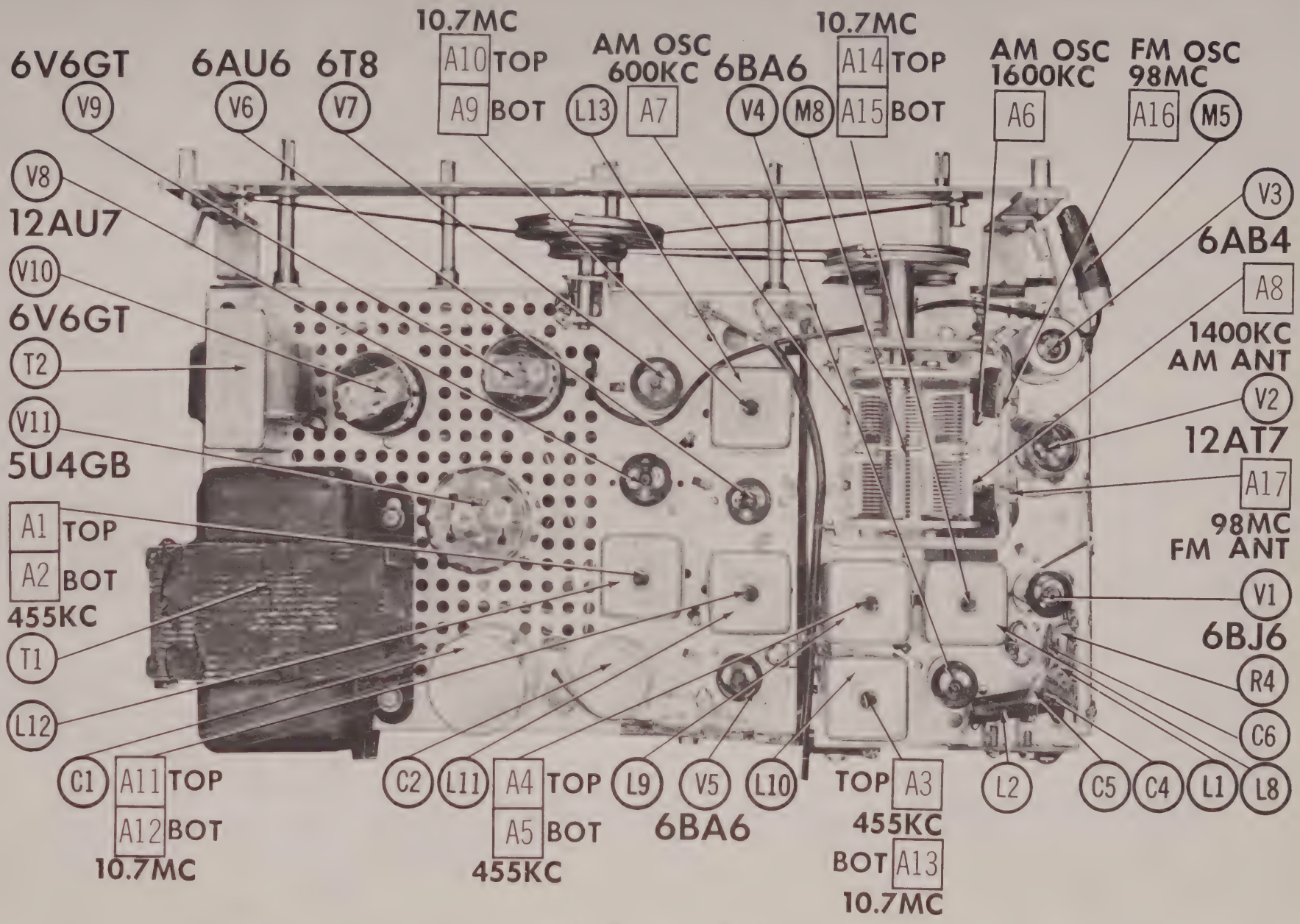


FIG. 2



CHASSIS-TOP VIEW

PARTS LIST AND DESCRIPTIONS

TUBES (GENERAL ELECTRIC, SYLVANIA)

ITEM No.	USE	TYPE	NOTES
V1	FM RF Amplifier	6BJ6	
V2	FM AM Mixer - FM AM Osc.	12AT7	
V3	FM AFC	6AB4	
V4	1st FM-AM IF Amp.	6BA6	
V5	2nd FM-AM IF Amp.	6BA6	
V6	FM Limiter	6AU6	

ITEM No.	USE	TYPE	NOTES
V7	Disc.-AM Det.-AVC-AF Amplifier	6T8	
V8	AF Amp.-Phase Inv.-Phono Preamplifier	12AU7	
V9	Output	6V6GT	
V10	Output	6V6GT	
V11	Rectifier	5U4GB	

ELECTROLYTIC CAPACITORS

ITEM No.	RATING CAP.	RATING VOLT.	REPLACEMENT DATA ZENITH PART No.	AEROVOX PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	PYRAMID PART No.	SANGAMO PART No.	SPRAGUE PART No.
C1A	▲40	450	22-1612	AFH2-57	B0450	FP238	TMD-54	D-235	TVL-2764
B	▲40	450							
C2A	■20	350	22-2905	AFH2-37	B0300	FP227	TMD-35	D-160	TVL-2626
B	▲20	350							
C3	3	30NP	22-2945	NP-PRS50V4	BBR5-50 † BBR5-50 †	TC504	TD-5-50 † TD-5-50 †	MMT-0505† MMT-0505†	R2601 *

† Connect negative leads together. * Non-Catalog Item.

FIXED CAPACITORS

Capacity values given in the rating column are in mfd. for Paper Capacitors, and in mmfd. for Mica and Ceramic Capacitors.

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA ZENITH PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C4	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C5	7.5		22-1852						
C6	100	1000	22-5	HVD-15-100	DD-101	L10T1		5GA-T1	
C7	1000		22-1676	SI 1000	D6-102	LT6D1	UC-521	5GA-D1	
C8	1000		22-1676	SI 1000	D6-102	LT6D1	UC-521	5GA-D1	
C9	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C10	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C11	.68		22-1766		TCZ-R68				
C12	50		22-1367	SI 50	D6-500	LT6Q5	UC-545	5GA-Q5	
C13	19		22-2630						
C14	1000		22-2732	EF-001	MFT-1000			503C-D1	
C15	1000		22-1676	EF-001	MFT-1000			503C-D1	
C16	22		22-1506	SI 22	D6-220	LT6Q22	UC-5422	5GA-Q22	
C17	100	1000	22-5	HVD-15-100	DD-101	L10T1		5GA-T1	
C18	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C19	220		22-2321	SI 220	D6-221	LT6T22	UC-5322	5GA-T22	
C20	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C21	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C22	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	

CAPACITORS (cont)

ITEM No.	RATING CAP.	RATING VOLT	REPLACEMENT DATA ZENITH PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.	NOTES
C23	.047	200	22-2792	P288N-047	DF-503	CUB2S47	GEM-4147	2TM-S47	
C24	4700	1000	22-14	DAC-8	DD30-472	BYA10D47		5GA-D47	
C25	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S1	
C26	1000		22-2732	EF-001	MFT-1000			503C-D1	
C27	2200		22-18			1R5D22		MS-222	10%
C28	.047	600	22-2797						10%
C29	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C30	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C31	25		22-2373	DI-000025	DD-250	L10Q25	UC-5425	5GA-Q25	
C32	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C33	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C34	470	800	22-16						①
C35	100	1000	22-5	HVD-15-100	DD-101	L10T1		5GA-T1	10%
C36	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C37	150		22-2875	N750-DI 150	DTN-150	C10T15U		5TCU-T15	② 10% N750
C38	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C39	10000	1000	22-3	DAC-27	DD-103	HVE16S1		BL-S10	
C40	.0068	200	22-2816	P288N-0068	D6-682	CUB6D68	GEM-6268	6TM-D68	③
C41	470		22-2900						
C42	180		22-2999		DTN-180	C10T18U			④ N750
C43	22		22-2372	NPO-DI 22	DD-220	L10Q22		5TCC-Q22	⑤ 10%
C44	.01	200	22-2813				GEM-16S1		10%
C45	1000	1000	22-17						10%
C46	.1	600	22-2782	P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	
C47	.022	200	22-2807						10%
C48	.022	200	22-2807						10%
C49	1000	1000	22-17						10%
C50	,022	200	22-2807						10%
C51	4700	1000	22-14	DAC-8	DD30-472	BYA10D47		5GA-D47	
C52	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	
C53	680		22-2668	1464-00068	D6-681	5R5T68		MS-368	10%
C54	.1	600	22-2782	P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	
C55	.1	600	22-2782	P688N-1	DF-104	CUB6P1	GEM-601	6TM-P1	
C56	.01	200	22-2813				GEM-16S1		10%
C57	4700	1000	22-14	DAC-8	DD30-472	BYA10D47		5GA-D47	
C58	.047	200	22-2792	P288N-047	DF-503	CUB2S47	GEM-4147	2TM-S47	
C59	4700	1000	22-14						10%
C60	470		22-2900						
C61	470		22-2900						
C62A	4700	1000	22-24	DAC-8	DD30-472	BYA10D47		5GA-D47	
B	4700	1000		DAC-8	DD30-472	BYA10D47		5GA-D47	
C63A	4700	1000	22-24	DAC-8	DD30-472	BYA10D47		5GA-D47	
B	4700	1000		DAC-8	DD30-472	BYA10D47		5GA-D47	
C64	10000	1000	22-3	DAC-27	DD16-103	HVE16S1		BL-S10	

① Chassis 11A20 uses 1000mmf 10% in this application (Part #22-1676).
② Chassis 11A20 uses 220mmf 10% in this application (Part #22-2703).
③ Chassis 11A20 uses 4700mmf 10% in this application (Part #22-14).
④ Chassis 11A20 uses 470mmf 10% in this application (Part #22-16).
⑤ Chassis 11A20 uses 47mmf 10% in this application (Part #22-2376).

PARTS LIST AND DESCRIPTIONS (Continued)

CONTROLS

ITEM No.	RATING		REPLACEMENT DATA					INSTALLATION NOTES
	RESISTANCE	WATTS	ZENITH PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	IRC PART No.	MALLORY PART No.	
R1A	3meg	½	63-4030					Loudness, TAP ② 500K
B	Switch							
R2A	3meg	½	63-4031	B-84	A47-3meg-S	Q11-140	U59	Presence
B	Shaft			Not Req.	KSS-3	Not Req.	Not Req.	
R3A	3meg	½	63-4037 ①	F1-78			■UE3827	Bass
B	250K	½		R2-35				Treble

■ STA-LOC Equivalent: FA36L, OS1750, RU254A, IK2312
① Part #63-4937 may be used in some versions.

RESISTORS

All wattages 1/2 watt, or less, unless otherwise listed.

ITEM No.	RATING		ZENITH PART No.	NOTES
	OHMS	WATT		
R4	2.2meg		63-1926	
R5	220Ω		63-1758	
R6	220Ω		63-1758	
R7	220Ω		63-1758	
R8	10K		63-1827	
R9	1000Ω		63-1786	
R10	2200Ω		63-1800	
R11	47Ω		63-1730	
R12	100K		63-1870	
R13	2.2meg		63-1926	
R14	1800Ω		63-1796	
R15	220Ω		63-1758	
R16	4.7meg		63-1940	
R17	4.7meg		63-1940	
R18	2.2meg		63-1926	
R19	220Ω		63-1758	
R20	100K		63-1870	
R21	220Ω		63-1758	
R22	220Ω		63-1758	
R23	100Ω		63-1744	
R24	100K		63-1870	
R25	15K		63-1835	
R26	100K		63-1869	
R27	100K		63-1869	
R28	47K		63-1856	
R29	220K		63-1884	
R30	100K		63-1869	
R31	10meg		63-1954	
R32	2000Ω	7	63-3694	
R33	1000Ω		63-1786	

ITEM No.	RATING		ZENITH PART No.	NOTES
	OHMS	WATT		
R34	220K		63-1884	①
R35	470K		63-1898	②
R36	270K		63-1887	③
R37	82K		63-1866	
R38	22K		63-1841	④
R39	680K		63-1904	
R40	2200Ω		63-1799	
R41	10meg		63-1954	
R42	100K		63-1869	
R43	820Ω		63-1762	
R44	100K		63-1869	
R45	100K		63-1869	
R46	68K		63-1862	
R47	220K		63-1883	
R48	220K		63-1884	
R49	270K		63-1887	
R50	390K		63-1894	
R51	47K		63-1856	
R52	3300Ω		63-1806	
R53	390K		63-1894	
R54	470K		63-1897	
R55	220Ω	2	63-3231	
R56	22K		63-1841	
R57	4700Ω		63-1814	
R58	150K		63-1877	
R59	4700Ω		63-1814	
R60A	2200Ω	8		
B	120Ω	3	63-3692	
C	1000Ω	5		
D	1200Ω	5		

① Chassis 11A20 uses 470K in this application (Part #63-1898).
② Chassis 11A20 uses 680K in this application (Part #63-1905).
③ Chassis 11A20 uses 330K in this application (Part #63-1891).
④ Chassis 11A20 uses 68K in this application (Part #63-1862).

COILS (RF-IF)

ITEM No.	USE	REPLACEMENT DATA					NOTES
		ZENITH PART No.	Meissner PART No.	Merit PART No.	Miller PART No.	Ram PART No.	
L1	FM Ant. Coil	20-682 *	19-1000	BC-561	4602		1 Microhenry
L2	RF Choke	20-337	19-1003	BC-537	4608		4.2 Microhenries
L3	Fil. Choke	20-337	19-1003	BC-537	4608		4.2 Microhenries
L4	FM RF Coil	S-15743					
L5	FM Osc. Coil	S-15691					
L6	Loop Ant.	S-40795					
L7	AM Osc. Coil	S-42847					
L8	1st FM IF	95-1150	16-3487 *	FM-251	1451		
L9	1st AM IF	95-1250					
L10A	2nd FM IF	95-1251					
B	2nd AM IF						
L11	3rd FM IF	95-1150	16-3487 *	FM-251	1451		
L12	3rd AM IF	95-1102	16-6770 *	BC-355 *	12-C6 *		
L13	Discriminator	95-1153					

* Use adapter plate.

TRANSFORMER (POWER)

ITEM No.	RATING			REPLACEMENT DATA						
	PRI.	SEC. 1	SEC. 2	ZENITH PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.
T1	117V ② 1A	680VCT ② .140A	5V ② 3A	95-1538						
	SEC. 3	SEC. 4	SEC. 5							
	6.3VCT ② 2A	6.3V ② 1.3A								

TRANSFORMER (AUDIO OUTPUT)

ITEM No.	IMPEDANCE		REPLACEMENT DATA							NOTES
	PRI.	SEC.	ZENITH PART No.	Halldorson PART No.	Merit PART No.	Ram PART No.	Stancor PART No.	Thordarson PART No.	Triad PART No.	
T2	9000Ω CT	3-4Ω	95-1571	Z1404	A-2936	AU-604	A-3335	24S56	S-19Z	

SPEAKER

ITEM No.	TYPE			REPLACEMENT DATA		NOTES
	SIZE	FIELD	V. C. IMP.	ZENITH PART No.	QUAM PART No.	
SP1	12"	PM	3-4Ω	49-836	12A6A	① Alternate Part #S-23829
SP2	7½"	PM	19Ω	49-816	8A31Z19	
SP3	3½"X3 1/4"	Electrostatic		S-24202 ①		
SP4	3½"X3 1/4"	Electrostatic		S-24202 ①		

PARTS LIST AND DESCRIPTIONS (Continued)

SELENIUM RECTIFIER

ITEM No.	RATING	REPLACEMENT DATA				NOTES
	CURRENT (Measured)	ZENITH PART No.	FEDERAL PART No.	INTERNATIONAL PART No.	SARKES TARZIAN PART No.	
M1		63-3977	1215 ①	1T1 ①		① Two used.

FUSES

ITEM No.	TYPE	RATING	REPLACEMENT DATA					
			ZENITH PART No.		LITTELFUSE PART No.		BUSS PART No.	
			FUSE	HOLDER	FUSE	HOLDER	FUSE	HOLDER
M2	3AG	2A 250V	136-36	62-17	312002. (2A 250V)	342001	AGC2	HKP

PHONO CARTRIDGE

ITEM No.	REPLACEMENT DATA					REMARKS
	ZENITH PART No.	ASTATIC PART No.		JENSEN PART No.		
		CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M3	142-88 142-76	81-TB				Models HF1178RD, HF1185MD, RD Models HF1284D, ED, LD, YD, HF1286RD

PHONO NEEDLE

(FOR REPLACEMENT IN ORIGINAL EQUIPMENT CARTRIDGE)

ITEM No.	REPLACEMENT DATA			REMARKS
	ZENITH PART No.	JENSEN PART No.	WALCO PART No.	
M4				

MISCELLANEOUS

ITEM No.	PART NAME	ZENITH PART No.	NOTES
M5	Lamp	100-221	#45, Ch. 11A21
M6	Lamp	100-221	#45, Ch. 11A21
M7	Lamp	100-189	#1891
	Lamp	100-67	Ch. 11A20
	Lamp	100-67	Ch. 11A20
M8	Tuning Cap.	22-3019	2 Gang, AM (Ant. 20-457mmf, Osc. 30-195mmf)
M9	Switch	85-583	Band, Rotary Wafer Type
M10	Switch	85-597	Record Compensator, Rotary Wafer Type

CABINETS & CABINET PARTS

(When Ordering Cabinets & Cabinet Parts, Specify Model, Chassis & Color)

NAME	PART NO.	DESCRIPTION
Pointer	59-333	Ch. 11A21
Pointer	59-332	Ch. 11A20
Scale	S-40766	Dial, Includes background strip assembly, Ch. 11A21
Scale	S-41956	Dial, Includes background strip assembly, Ch. 11A20
Dial Crystal	192-229	Dial
Lens	171-7	Pilot Lamp, Models HF1284D, ED, LD, YD, HF1286RD
Lens	171-16	Pilot Lamp, Models HF1178RD, HF1185MD, RD
Knob	46-1020	Radio-Phono, Record Compensator, On-Off, Loudness, Presence, Model HF1286RD
Knob	46-1357	Radio-Phono, Record Compensator, On-Off, Loudness, Presence, Models HF1284D, ED, LD
Knob	46-1866	Radio-Phono, Record Compensator, On-Off, Loudness, Presence, Model HF1284YD
Knob	46-1828	Radio-Phono, Record Compensator, On-Off, Loudness, Presence, Model HF1178RD
Knob	46-1639	Tuning, Models HF1284D, ED, LD, YD, HF1185MD, RD, HF1286RD
Knob	46-1839	Tuning, Model HF1178RD
Knob	46-1640	Bass, Models HF1178RD, HF1185MD, RD
Knob	46-1686	Bass, Models HF1284D, ED, LD, YD, HF1286RD
Knob	46-1641	Treble, Model HF1286RD
Knob	46-1642	Treble, Models HF1284D, ED, LD
Knob	46-1829	Treble, Models HF1178RD, HF1185MD, RD
Knob	46-1867	Treble, Model HF1284YD
Cabinet	14-2314R	Model HF1286RD
Cabinet	14-2315	Model HF1284D
Cabinet	14-2315E	Model HF1284ED
Cabinet	14-2315L	Model HF1284LD
Cabinet	14-2315Y	Model HF1284YD
Cabinet	14-2328R	Model HF1178RD
Cabinet	14-2313R	Model HF1185RD
Cabinet	14-2313M	Model HF1185MD
Leg	96-113	Cabinet, Models HF1284D, ED, LD, YD
Leg	96-114	Cabinet, Models HF1284D, ED. LD, YD
Leg	96-149	Cabinet, Models HF1284D, ED, LD, YD
Leg	96-151	Cabinet, Models HF1284D, ED, LD, YD
Leg	96-156	Cabinet, Model HF1178RD

WIRING DATA

General-use Unshielded Hook-up Wire ..... Use BELDEN No. 8530 (Solid) Available in Ten Colors
8524 (Stranded) Available in Ten Colors

Power Cord ..... Use BELDEN No. 1765-B (6 Ft. Length)
1725-K (7½ Ft. Length)

Low-Loss Shielded Lead (Interconnecting) ..... Use BELDEN No. 8401

Phono Pick-up Arm Cable ..... Use BELDEN No. 8430 (Two Conductor - Twisted)